MODEL GR-78 General Coverage Receiver

HEATHKIT®

ASSEMBLY MANUAL

GR-78
18550

HEATH COMPANY • BENTON HARBOR, MICHIGAN

HEATHKIT®

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Price $2.00

595-1046-10

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The following telephone numbers are direct lines to the departments listed:

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349

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And if you are dissatisfied with our service — warranty or otherwise — or our products, write directly to our Director of Customer Services, Heath Company, Benton Harbor, Michigan, 49022. Telephone (616) 982-3524. He'll make certain your problems receive immediate, personal attention.

HEATH COMPANY
BENTON HARBOR, MI. 49022

Prices and specifications subject to change without notice.

Assembly
and
Operation
of the

HEATHKIT

GENERAL COVERAGE RECEIVER

Model GR-78

616-982-3571
418-23
BATTERY

HEATHKIT
BANDSPREAD
AF/RF GAIN
OFF
LIGHT
RCV
CAL
AM
AVC
OFF
STBY
CW
SSB
MVC
ANL
MODEL GR-78
BAND
MAIN TUNING
A
B
C
D
E
F

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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INTRODUCTION

The Heathkit Model GR-78 General Coverage Receiver is designed primarily for amateur and shortwave listener use. Many new circuit components and design concepts have been used to provide the user with a portable receiver having many features of higher priced units.

Six bands provide coverage from 190 kHz to 30 MHz, with double conversion on the 18 to 30 MHz band. An AM-CW/SSB switch enables the operator to select AM (amplitude modulation), CW (continuous wave), or SSB (single sideband) reception. The Receiver features calibrated bandspread for either the major shortwave broadcast bands or the amateur bands.

This compact, lightweight Receiver operates from an internal rechargeable nickel-cadmium battery for portable operation. The battery can be charged from a 120/240 VAC or 12 to 15 VDC power source. The battery recharges when the receiver is turned OFF and connected to one of these power sources.

For night readings, two front panel lamps are included with a spring-return Light switch to conserve battery life.

Other features include a collapsible carrying handle, built-in 500 kHz crystal calibrator, operation from a built-in whip antenna or external antenna, an automatic noise limiter circuit, flywheel tuning, and no-adjust ceramic IF filters for sharp selectivity. Plug-in, modular switch-boards contain the band switching circuits (antenna, RF amplifier, mixer, and oscillator) and provide easy assembly and service. The all solid-state circuitry includes thirteen silicon transistors, five of which are high gain FET's (field-effect transistors); and two germanium transistors. A separate FET product detector provides superior CW and SSB reception. A transformerless audio output circuit, combined with the solid-state circuits, minimizes current drain. The rugged construction and convenient operation are sure to provide you with many hours of dependable use and relaxed enjoyment.

Refer to the "Kit Builders Guide" for additional information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

UNPACKING INSTRUCTIONS

The General Coverage Receiver packaging consists of the large shipping carton, which contains smaller packages and a number of loose parts. Some of the smaller packages have numbers 1 through 5 stamped on them. After these five numbered packages have been removed from the large carton, the remaining parts will be considered to be package #6.

Package #6 consists of items too large to fit into the small packages, and those items used in a number of assembly sections.

Each of the six assembly sections of the Manual contains a Parts List and Step-By-Step instructions. At the beginning of each Parts List you will be told which numbered package to open. You will also be directed to remove any parts from package #6 that are required to complete that assembly section.

To avoid intermixing parts, do not open any of the parts packages until directed to do so at the beginning of a Parts List. Any part that is packaged in an individual envelope, with a part number on it, should be placed back in the envelope after it is identified until it is called for in a step.

To order replacement parts, refer to the Replacement Parts Price List and use the Parts Order Form furnished with this kit.

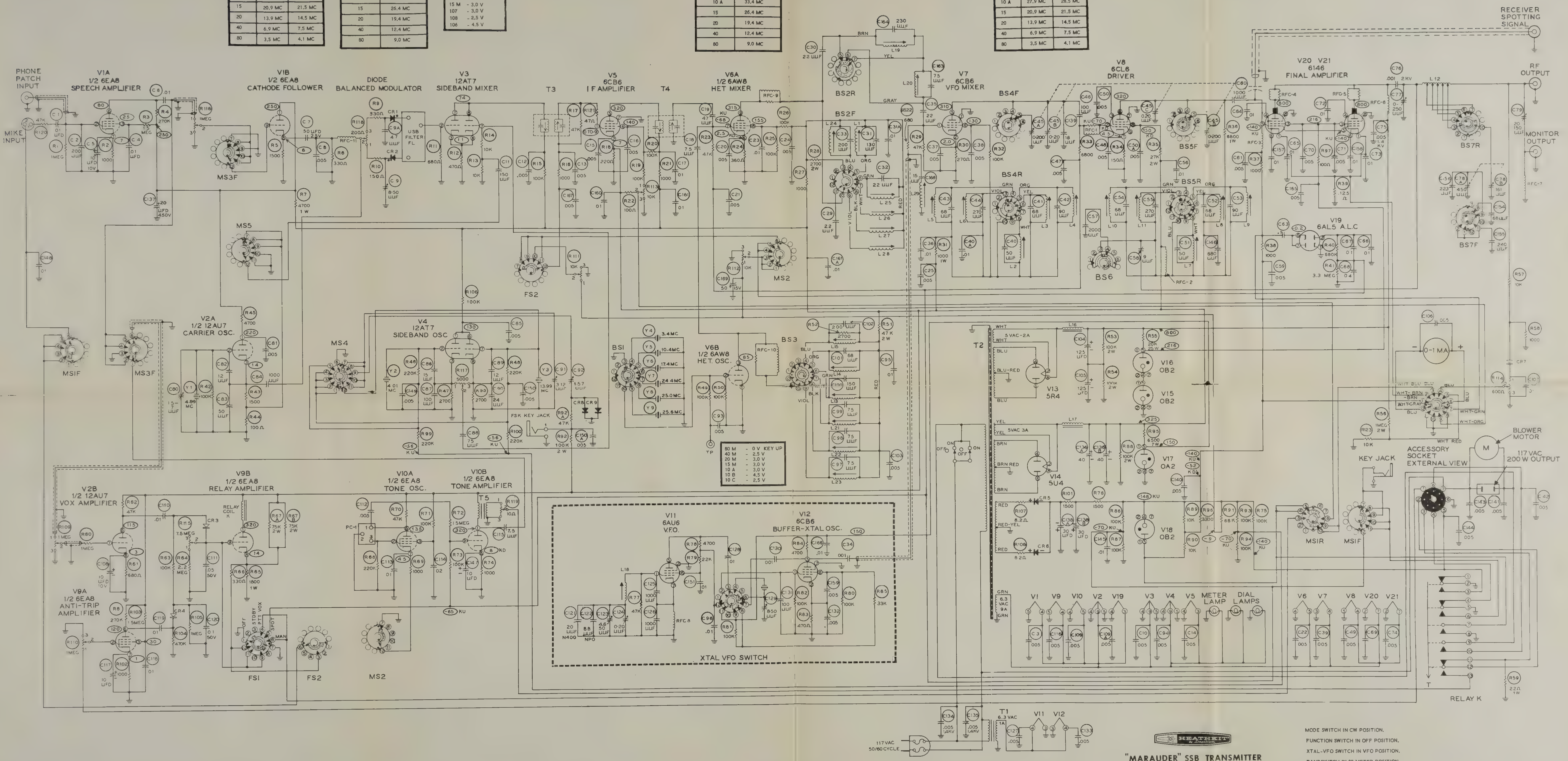
VFO MIXER OUTPUT		
	FROM	TO
10 C	29.1 MC	29.7 MC
10 B	28.5 MC	29.1 MC
10 A	27.9 MC	28.5 MC
15	20.9 MC	21.5 MC
20	13.9 MC	14.5 MC
40	6.9 MC	7.5 MC
80	3.5 MC	4.1 MC

HETERODYNE MIXER OUTPUT	
BAND	FREQUENCY
10 C	34.6 MC
10 B	34.0 MC
10 A	33.4 MC
15	26.4 MC
20	19.4 MC
40	12.4 MC
80	9.0 MC

80 M - 0 V KEY UP
40 M - 2.5 V
20 M - 3.0 V
15 M - 3.0 V
107 - 3.0 V
108 - 2.5 V
106 - 4.5 V

HETERODYNE MIXER OUTPUT	
BAND	FREQUENCY
10 C	34.6 MC
10 B	34.0 MC
10 A	33.4 MC
15	26.4 MC
20	19.4 MC
40	12.4 MC
80	9.0 MC

VFO MIXER OUTPUT		
	FROM	TO
10 C	29.1 MC	29.7 MC
10 B	28.5 MC	29.1 MC
10 A	27.9 MC	28.5 MC
15	20.9 MC	21.5 MC
20	13.9 MC	14.5 MC
40	6.9 MC	7.5 MC
80	3.5 MC	4.1 MC


PHONE PATCH INPUT
MIKE INPUT
V1A 1/2 6EA8 SPEECH AMPLIFIER
V1B 1/2 6EA8 CATHODE FOLLOWER
DIODE BALANCED MODULATOR
USB FILTER FL
V3 12AT7 SIDEBAND MIXER
T3
V5 6CB6 I F AMPLIFIER
T4
V6A 1/2 6AW8 HET MIXER
BS2R
BS2F
V7 6CB6 VFO MIXER
BS4F
BS4R
V8 6CL6 DRIVER
BS5F
BS5R
BS6
V20 V21 6146 FINAL AMPLIFIER
RECEIVER SPOTTING SIGNAL
RF OUTPUT
MONITOR OUTPUT
BS7R
BS7F
V19 6AL5 A.L.C
MS3F
MS5
MS4
MSIF
V2A 1/2 12AU7 CARRIER OSC.
V4 12AT7 SIDEBAND OSC
FS2
MS2
FSK KEY JACK
BSI
V6B 1/2 6AW8 HET. OSC.
BS3
TP
T2
V13 5R4
V16 OB2
V15 OB2
V14 5U4
V17 OA2
V18 OB2
0-1 MA
BLOWER MOTOR
117 VAC 200 W OUTPUT
KEY JACK
ACCESSORY SOCKET EXTERNAL VIEW
MSIR
MSIF
V2B 1/2 12AU7 VOX AMPLIFIER
V9B 1/2 6EA8 RELAY AMPLIFIER
RELAY COIL K
V10A 1/2 6EA8 TONE OSC.
V10B 1/2 6EA8 TONE AMPLIFIER
T5
V9A 1/2 6EA8 ANTI-TRIP AMPLIFIER
STDBY PTT VOX SPOT MAN OFF
FSI
FS2
MS2
V11 6AU6 V.F.O.
V12 6CB6 BUFFER-XTAL OSC.
XTAL VFO SWITCH
V1 V9 V10 V2 V19 V3 V4 V5 METER LAMP DIAL LAMPS
V6 V7 V8 V20 V21
RELAY K
T1 6.3 VAC
V11 V12
117VAC 50/60 CYCLE

80 M - 0 V KEY UP
40 M - 2.5 V
20 M - 3.0 V
15 M - 3.0 V
10 A - 3.0 V
10 B - 4.5 V
10 C - 2.5 V

HEATHKIT by Daystrom

"MARAUDER" SSB TRANSMITTER
MODEL HX-10

MODE SWITCH IN CW POSITION.

FUNCTION SWITCH IN OFF POSITION.

XTAL-VFO SWITCH IN VFO POSITION.

BANDSWITCH IN 80 METER POSITION.

METER SWITCH IN "GRID" POSITION.

ALL VOLTAGES MEASURED WITH A VTVM.

◯ INDICATES VOLTAGE READINGS.

ALL VOLTAGES ARE POSITIVE UNLESS OTHERWISE SHOWN.

ALL CAPACITORS LISTED ARE IN µfd UNLESS OTHERWISE SHOWN.

ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SHOWN.

AC VOLTAGES TAKEN WITH FUNCTION SWITCH IN STBY POSITION. MODE SWITCH IN CW-KEY UP (KU) UNLESS OTHERWISE SPECIFIED (KD = KEY DOWN).

SEE MANUAL TEXT FOR RF VOLTAGES (MEASURED ONLY WITH AN RF PROBE).

CIRCUIT BOARDS

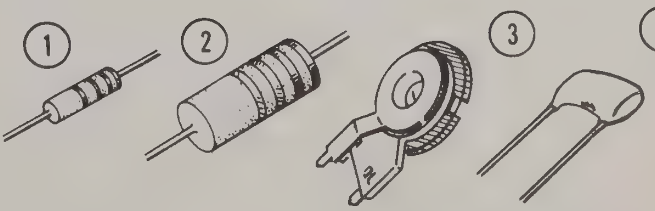
RECEIVER CIRCUIT BOARD PARTS LIST

Unpack package #1 and check each part against the following parts list. The key numbers correspond to the numbers in the Parts Pictorial.

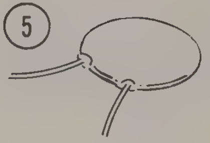
KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS-CONTROL			
1/2 Watt Resistors			
1	1-103	1	33 Ω (orange-orange-black)
	1-3	3	100 Ω (brown-black-brown)
	1-4	1	330 Ω (orange-orange-brown)
	1-6	1	470 Ω (yellow-violet-brown)
	1-7	2	680 Ω (blue-gray-brown)
	1-9	6	1000 Ω (brown-black-red)
	1-11	1	1500 Ω (brown-green-red)
	1-44	1	2200 Ω (red-red-red)
	1-89	1	2400 Ω (red-yellow red)
	1-14	3	3300 Ω (orange-orange-red)
	1-18	3	5600 Ω (green-blue-red)
	1-73	1	8200 Ω (gray-red-red)
	1-20	8	10 kΩ (brown-black-orange)
	1-109	1	12 kΩ (brown-red-orange)
	1-21	3	15 kΩ (brown-green-orange)
	1-23	1	27 kΩ (red-violet-orange)
	1-24	3	33 kΩ (orange-orange-orange)
	1-25	2	47 kΩ (yellow-violet-orange)
	1-60	2	68 kΩ (blue-gray-orange)
	1-26	3	100 kΩ (brown-black-yellow)
	1-27	1	150 kΩ (brown-green-yellow)
	1-29	1	220 kΩ (red-red-yellow)
	1-33	1	470 kΩ (yellow-violet-yellow)

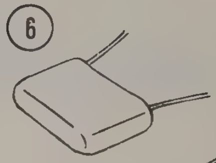
KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
2 Watt Resistor-Control			
2	3-7-2	2	1 Ω (brown-black-gold) resistor
3	10-241	1	10 kΩ control
CAPACITORS			
Mica			
4	20-130	2	12 pF
	20-77	1	24 pF
	20-102	3	100 pF
	20-104	1	130 pF
	20-164	1	180 pF
	20-139	1	330 pF
	20-106	1	390 pF
	20-134	1	680 pF

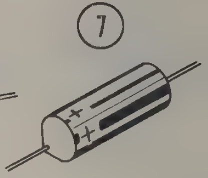
PARTS PICTORIAL

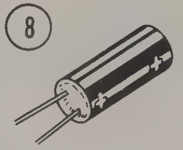


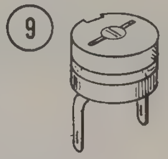
KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
Ceramic			
5	21-61	1	6.8 pF
	21-21	1	200 pF
	21-140	1	.001 μF
	21-47	2	.01 μF
	21-143	6	.05 μF
	21-95	8	.1 μF
Mylar*			
6	27-60	3	.22 μF
	27-61	1	.47 μF
Electrolytic			
7	25-123	1	2 μF
8	25-115	5	10 μF
	25-117	3	100 μF
Trimmer			
9	31-36	1	8-50 pF

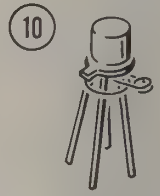


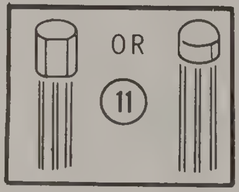


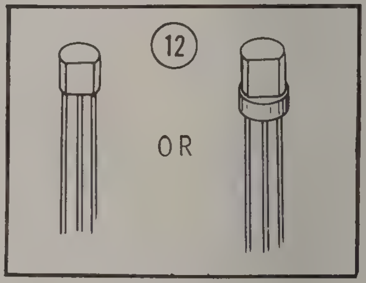


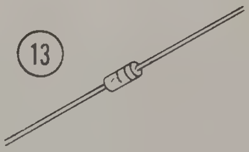


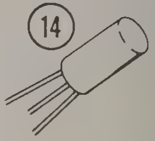












TRANSISTORS-DIODES

NOTE: Transistors are marked for identification in one of the following four ways:

1. Part number.
2. Transistor type number.
3. Part number and transistor type number.
4. Part number with a transistor type number other than the one listed.

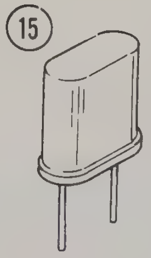
Do not remove the shorting spring from around the leads of each 40673 transistor (#417-274). Leave it in place until you are instructed to remove it.

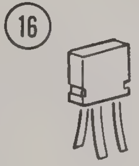
10	417-274	2	40673 transistor
11	417-171	5	2N3694 transistor
12	417-118	21	2N3393 transistor
	417-201	1	X29A829 transistor
13	56-26	4	1N191 diode
	117-6	1	Packaged transistor set
consisting of:			
14	417-121	1	2N2430 transistor
	417-122	1	2N2431 transistor

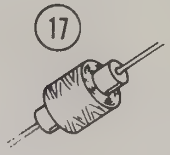
---

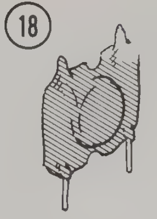
*DuPont Registered Trademark

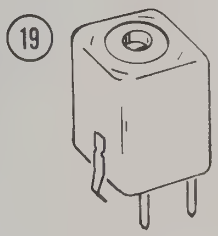
KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
MISCELLANEOUS			
15	404-238	1	3579.545 kHz crystal
	404-367	1	500 kHz crystal
16	404-399	4	455 kHz ceramic filter
17	45-47	1	2 mH RF choke
18	40-487	3	300 μH inductor
19	52-118	1	BFO coil
	52-119	1	Band F conversion oscillator coil
20	215-19	2	Heat sink
Items From Pack #6			
	344-59	1	White wire
	85-278-5	1	Circuit board
	597-308	1	Kit Builders Guide
		1	Manual (See front cover for part number.)
			Solder

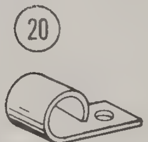












NOTE: The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

STEP-BY-STEP ASSEMBLY

Before you start to assemble this kit, be sure to read the Kit Builders Guide for complete information on wiring, soldering, and step-by-step assembly procedures.

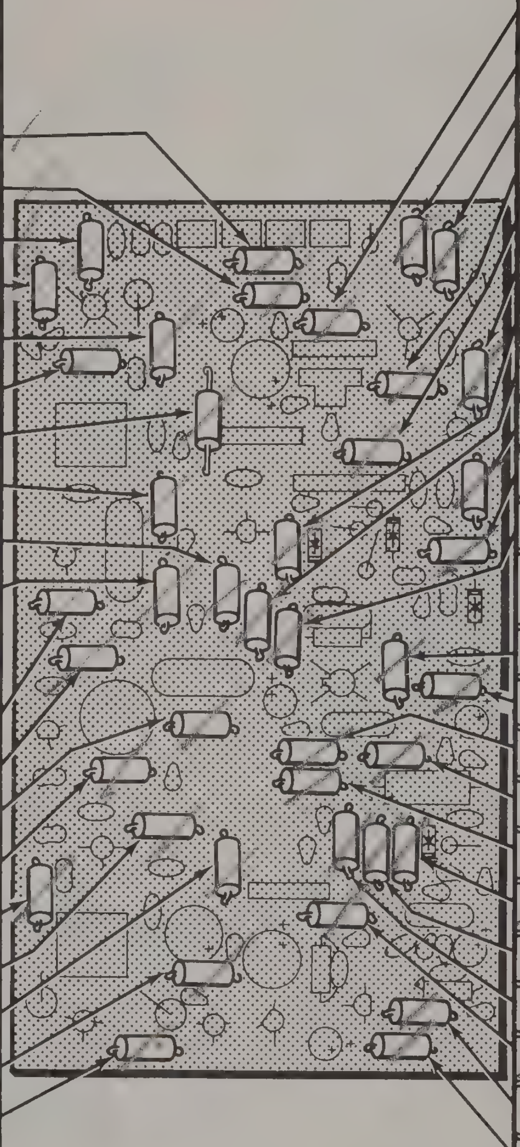
Components will be installed on the circuit boards in the following circuit board pictorials. Position all parts as shown. Follow the instructions carefully and read the entire step before performing the operation.

Use 1/2 watt resistors unless directed otherwise in a step. All resistors will be called out by their resistance value (in Ω, or kΩ). The color code will also be given for color-coded resistors. Capacitors will be called out by their type and capacitance value (in pF, or μF).

After completing each circuit board, check to make sure that all connections are soldered and that there are no solder bridges between adjacent foils. If you find a solder bridge, refer to the Kit Builders Guide for information on correcting it.

START

- ( ) Position the receiver circuit board (#85-278-5) as shown in Pictorial 1-1. Then complete each step on Pictorial 1-1.
- (✓) 330 Ω (orange-orange-brown).
- (✓) 10 kΩ (brown-black-orange).
- (✓) 100 Ω (brown-black-brown).
- (✓) 100 kΩ (brown-black-yellow).
- (✓) 5600 Ω (green-blue-red).
- (✓) 1000 Ω (brown-black-red).
- (✓) 15 kΩ (brown-green-orange).
- (✓) 100 Ω (brown-black-brown).
- (✓) 3300 Ω (orange-orange-red).
- (✓) 15 kΩ (brown-green-orange).
- ( ) Solder all leads to the foil and cut off the excess lead lengths.
- (✓) 1000 Ω (brown-black-red).
- (✓) 3300 Ω (orange-orange-red).
- (✓) 470 kΩ (yellow-violet-yellow).
- (✓) 2200 Ω (red-red-red).
- (✓) 100 kΩ (brown-black-yellow).
- (✓) 5600 Ω (green-blue-red).
- (✓) 15 kΩ (brown-green-orange).
- (✓) 680 Ω (blue-gray-brown).
- (✓) 33 Ω (orange-orange-black).
- ( ) Solder all leads to the foil and cut off the excess lead lengths.



CONTINUE

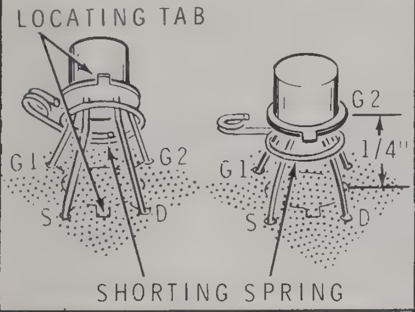
- (✓) 2400 Ω (red-yellow-red).
- (✓) 10 kΩ (brown-black-orange).
- (✓) 1000 Ω (brown-black-red).
- (✓) 27 kΩ (red-violet-orange).
- (✓) 1500 Ω (brown-green-red).
- (✓) 5600 Ω (green-blue-red).
- (✓) 8200 Ω (gray-red-red).
- (✓) 150 kΩ (brown-green-yellow).
- (✓) 470 Ω (yellow-violet-brown).
- (✓) 10 kΩ (brown-black-orange).
- (✓) 680 Ω (blue-gray-brown).
- ( ) Solder all leads to the foil and cut off the excess lead lengths.
- (✓) 10 kΩ (brown-black-orange).
- (✓) 10 kΩ (brown-black-orange).
- (✓) 220 kΩ (red-red-yellow).
- (✓) 33 kΩ (orange-orange-orange).
- (✓) 47 kΩ (yellow-violet-orange).
- (✓) 68 kΩ (blue-gray-orange).
- (✓) 68 kΩ (blue-gray-orange).
- (✓) 10 kΩ (brown-black-orange).
- (✓) 1000 Ω (brown-black-red).
- (✓) 47 kΩ (yellow-violet-orange).
- (✓) 1000 Ω (brown-black-red).
- ( ) Solder all leads to the foil and cut off the excess lead lengths.

PROCEED TO PICTORIAL 1-2.

PICTORIAL 1-1

START

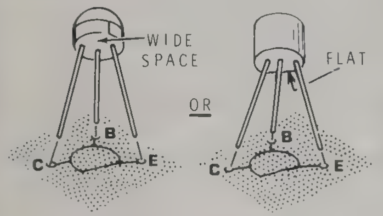
Install the 40673 (#417-274) transistors in the following manner: Line up the tab of the transistor with the tab outline on the circuit board. Then insert the transistor leads into their circuit board holes which are indicated by S, G1, G2, and D. Position the transistor 1/4" above the circuit board. Solder each lead to the foil and cut off the excess lead lengths. NOTE: Do not remove the shorting springs.

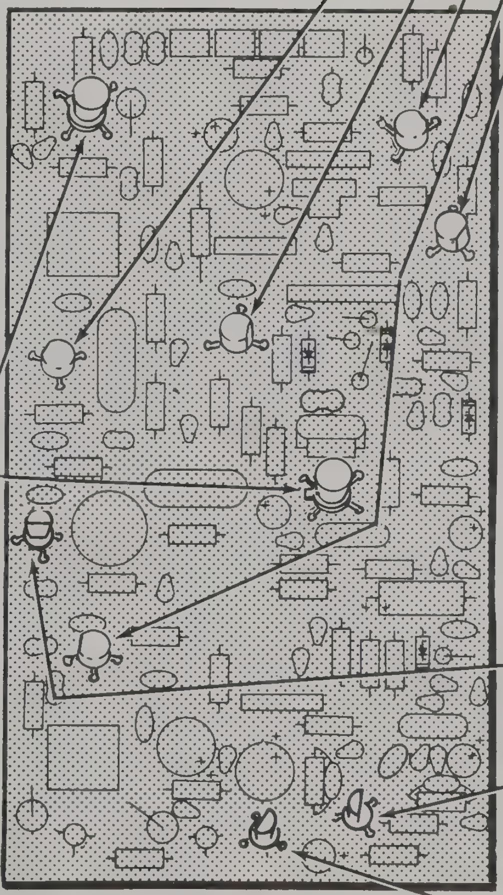


(✓) Transistor 40673 (#417-274) at Q401.

(✓) Transistor 40673 (#417-274) at Q405.

Install the five 2N3694 (#417-171) transistors in the following manner: Insert the transistor leads into their circuit board holes, which are indicated by C, B, and E. Position the transistor 1/4" above the circuit board. Solder each lead to the foil and cut off the excess lead lengths.





CONTINUE

(✓) Transistor 2N3694 (#417-171) at Q411.

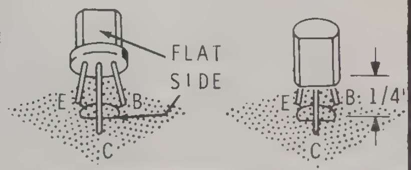
(✓) Transistor 2N3694 (#417-171) at Q404.

(✓) Transistor 2N3694 (#417-171) at Q402.

(✓) Transistor 2N3694 (#417-171) at Q410.

(✓) Transistor 2N3694 (#417-171) at Q403.

Install the two 2N3393 transistors and the X29A829 transistor in the following manner: Line up the flat side of the transistor with the flat outline on the circuit board. Then insert the transistor leads into their circuit board holes, which are indicated by E, C, and B. Position the transistor 1/4" above the circuit board. Solder each lead to the foil and cut off the excess lead lengths.



(✓) Transistor 2N3393 (#417-118) at Q412. NOTE: The collector lead is bent toward the flat side of the transistor.

(✓) Transistor 2N3393 (#417-118) at Q406. NOTE: The collector lead is bent away from the flat side of the transistor.

(✓) Transistor X29A829 (#417-201) at Q407. NOTE: The collector lead is bent away from the flat side of the transistor.

( ) Check to see that all connections are soldered.

PICTORIAL 1-2

PROCEED TO PICTORIAL 1-3

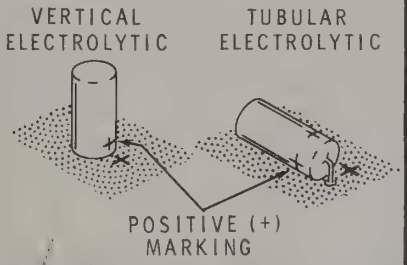
START

(✓) 100 pF mica.

(✓) 130 pF mica.

(✓) .1 µF ceramic.

NOTE: When installing electrolytic capacitors, always match the positive (+) mark on the capacitor with the positive (+) mark on the circuit board.



(✓) 10 µF electrolytic.

(✓) 100 µF electrolytic.

(✓) 24 pF mica.

(✓) .1 µF ceramic.

(✓) .001 µF ceramic.

( ) Solder all leads to the foil and cut off the excess lead lengths.

(✓) .01 µF ceramic.

(✓) 680 pF mica.

(✓) 200 pF ceramic.

(✓) 330 pF mica.

(✓) .1 µF ceramic.

(✓) 390 pF mica.

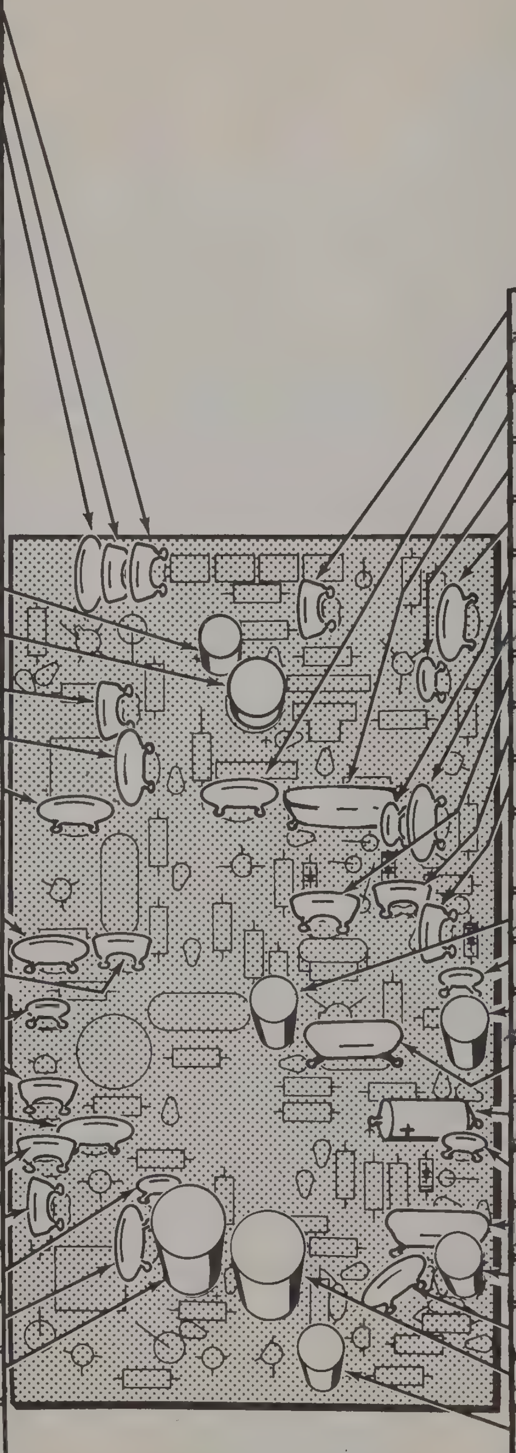
(✓) 180 pF mica.

(✓) 6.8 pF ceramic.

(✓) .1 µF ceramic.

(✓) 100 µF electrolytic.

( ) Solder all leads to the foil and cut off the excess lead lengths.



CONTINUE

(✓) 100 pF mica.

(✓) .1 µF ceramic.

(✓) .47 µF Mylar.

(✓) .05 µF ceramic.

(✓) .1 µF ceramic.

(✓) .05 µF ceramic.

(✓) .1 µF ceramic.

(✓) 12 pF mica.

(✓) 100 pF mica.

(✓) 12 pF mica.

( ) Solder all leads to the foil and cut off all excess lead lengths.

(✓) 10 µF electrolytic.

(✓) .05 µF ceramic.

(✓) 10 µF electrolytic.

(✓) .22 µF Mylar.

(✓) 2 µF electrolytic.

(✓) .05 µF ceramic.

(✓) .22 µF Mylar.

(✓) 10 µF electrolytic.

(✓) .05 µF ceramic.

(✓) 100 µF electrolytic.

(✓) 10 µF electrolytic.

(✓) Solder all leads to the foil and cut off all excess lead lengths.

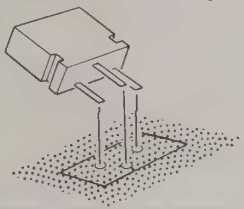
PROCEED TO PICTORIAL 1-4.

PICTORIAL 1-3

START

Solder all leads to the foil and cut off all excess lead lengths of each part as it is installed.

Four ceramic filters will be installed in the following steps. Install each filter as shown.



(✓) Ceramic filter (#404-399).

(✓) Ceramic filter (#404-399).

(✓) Ceramic filter (#404-399).

( ) Ceramic filter (#404-399).

(✓) 3579.545 kHz crystal (#404-238). Do not press the crystal flat against the board.

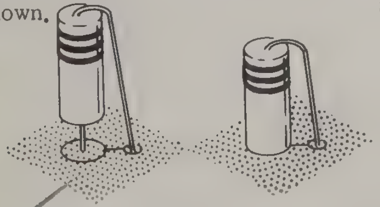
(✓) 500 kHz crystal (#404-367).

(✓) 8-50 pF trimmer (#31-36).

NOTE: When a wire is called for in a step, cut a piece of hookup wire to the indicated length. Then remove 1/4" of insulation from each end of the wire. Use white hookup wire unless specified otherwise in a step.

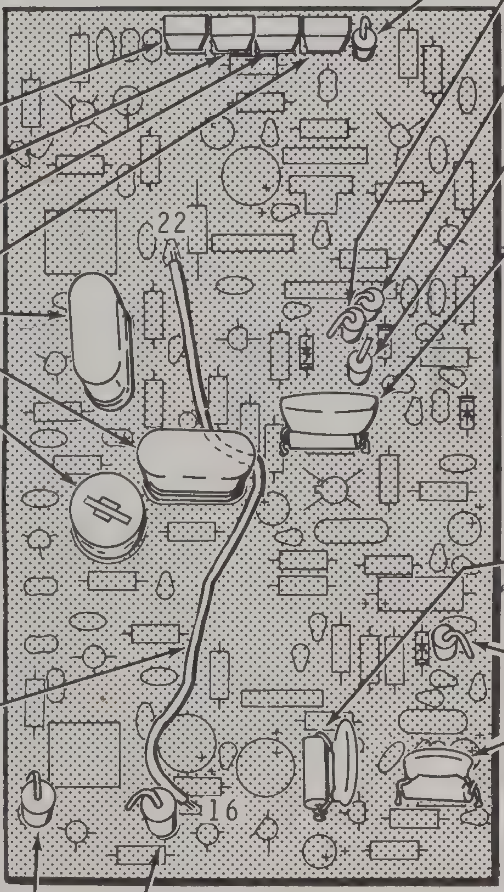
(✓) Form the 5-1/4" length of hookup wire to the shape shown on the circuit board. Bend the bare wire ends and insert one end into hole 22 and the other end into hole 16 of the circuit board. Solder both ends of the wire to the foil and then press the wire against the circuit board.

NOTE: When mounting resistors vertically, bend one lead and install the resistor on the circuit board as shown.



(✓) 1 Ω 2 W (brown-black-gold). Mount vertically.

(✓) 1 Ω 2 W (brown-black-gold). Mount vertically.



CONTINUE

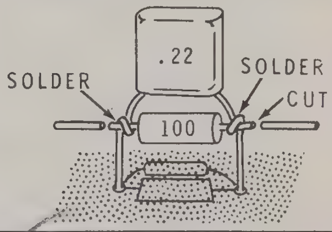
(✓) 3300 Ω (orange-orange-red). Mount vertically.

(✓) 100 kΩ (brown-black-yellow). Mount vertically.

(✓) 10 kΩ (brown-black-orange). Mount vertically.

(✓) 33 kΩ (orange-orange-orange). Mount vertically.

(✓) .22 μF Mylar capacitor and a 100 Ω (brown-black-brown) resistor. Prepare the capacitor-resistor combination as shown.



(✓) .01 μF ceramic capacitor and a 12 kΩ (brown-red-orange) resistor combination.

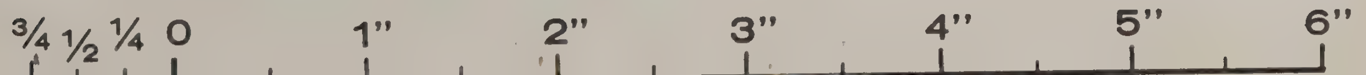
(✓) 33 kΩ (orange-orange-orange). Mount vertically.

(✓) .05 μF ceramic capacitor and a 10 kΩ (brown-black-orange) resistor combination.

( ) Check to see that all connections are soldered and that the excess lead lengths are cut off.

PROCEED TO PICTORIAL 1-5.

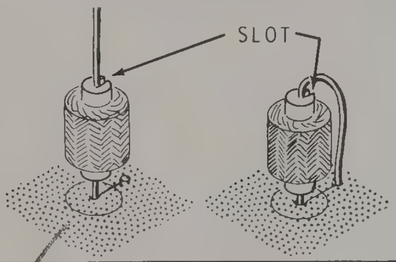
PICTORIAL 1-4



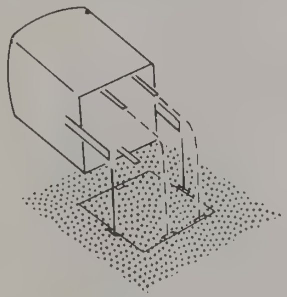
START

NOTE: Solder all connections and cut off the excess lead lengths as each part is installed.

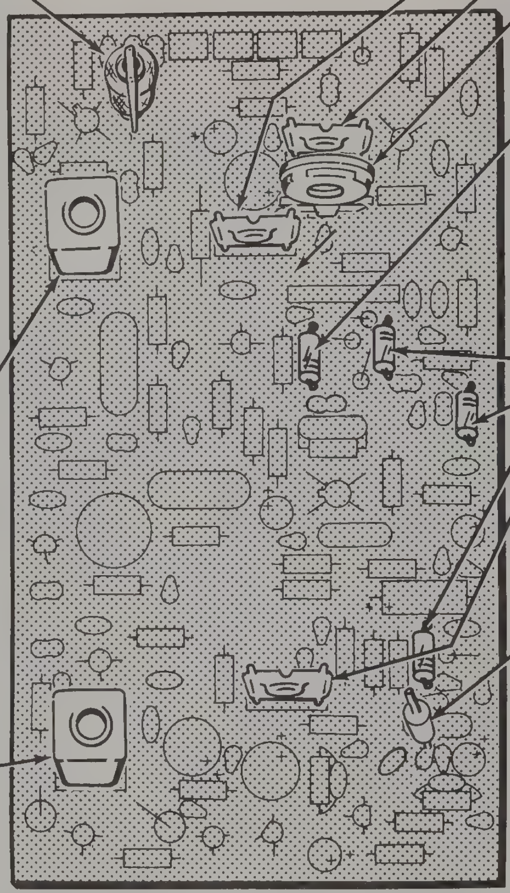
(✓) 2 mH RF choke (#45-47). Bend one choke lead toward the slot and install the choke on the circuit board as shown.



(✓) Mount the band F conversion oscillator coil (#52-119) as shown. Press it firmly against the circuit board before soldering.



( ) BFO coil (#52-118).



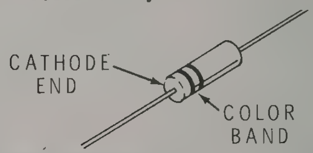
CONTINUE

(✓) 300 μH inductor (#40-487).

(✓) 300 μH inductor (#40-487).

(✓) 10 kΩ control (#10-241).

(✓) Diode (#56-26). Position the cathode end as shown on the circuit board. The cathode end is marked with a color dot or color band.



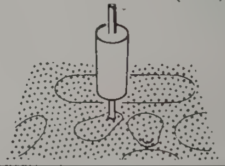
(✓) Diode (#56-26).

(✓) Diode (#56-26).

( ) Diode (#56-26).

(✓) 300 μH inductor (#40-487).

(✓) Cut both leads of a 1000 Ω (brown-black-red) resistor to 1/4". Insert one lead in hole 10 in the circuit board and solder the lead to the foil (S-1).



( ) Check to see that all connections are soldered and that the excess lead lengths are cut off.

PROCEED TO PICTORIAL 1-6.

PICTORIAL 1-5

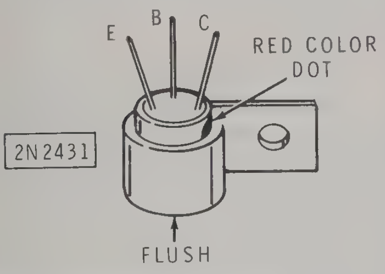
START

Locate the following parts:

(✓) Two transistor heat sinks (#215-19).

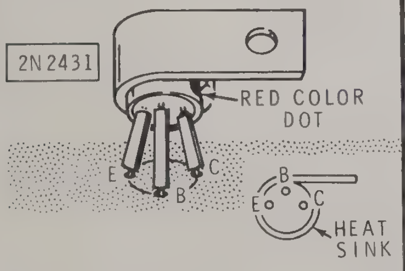
(✓) One 2N2430 and one 2N2431 matched pair of transistors (packed in enveloped marked 117-6).

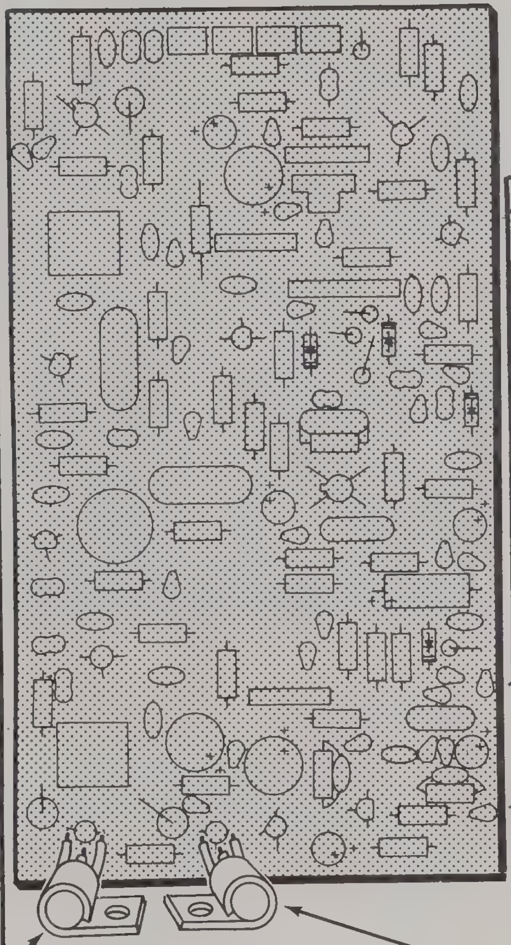
(✓) Position one of the heat sinks as shown. Insert the 2N2431 transistor into the heat sink. Make sure the red color dot is positioned as shown and the top of the transistor is flush with the edge of the heat sink. NOTE: The transistor should fit snugly in the heat sink.



(✓) Remove three 1/2" lengths of insulation from the hookup wire, and place a length on each lead of the transistor.

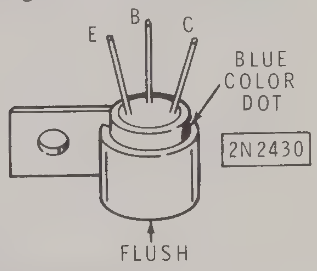
(✓) Install the prepared transistor on the circuit board as shown at Q409. Insert the transistor leads into their appropriate circuit board holes, which are indicated by E, B, and C. Solder each lead to the foil and cut off the excess lead lengths.





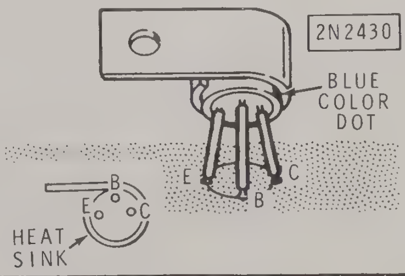
CONTINUE

(✓) Position the remaining heat sink as shown. Insert the 2N2430 transistor into the heat sink. Make sure the blue color dot is positioned as shown and the top of the transistor is flush with the edge of the heat sink.



(✓) Remove three 1/2" lengths of insulation from the hookup wire, and place a length on each lead of the transistor.

(✓) Install the prepared transistor on the circuit board as shown at Q408. Insert the transistor leads into their appropriate circuit board holes, which are indicated by E, B, and C. Solder each lead to the foil and cut off the excess lead lengths.



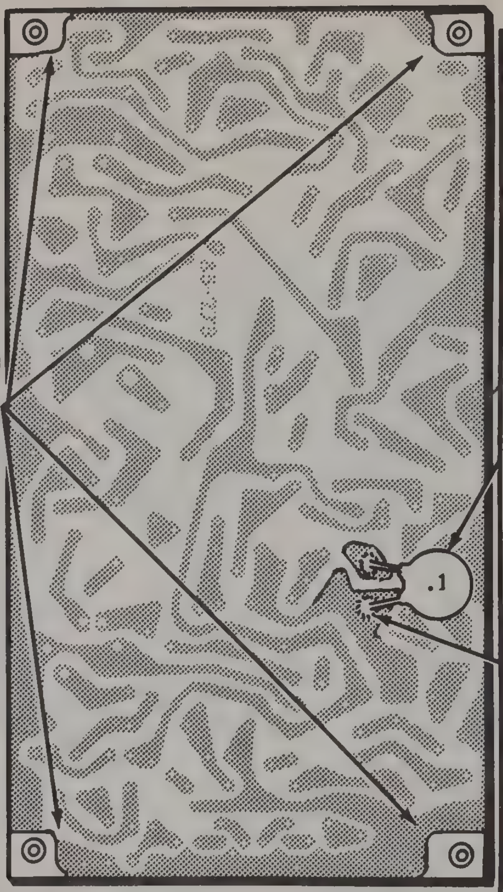
PICTORIAL 1-6

PROCEED TO PICTORIAL 1-7.

START

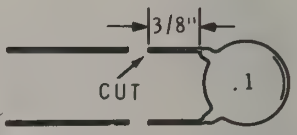
(✓) Position the circuit board with the foil side up as shown.

(✓) Melt a small amount of solder on the indicated foil area of each of the four circuit board corners. Then slowly draw the soldering iron over the indicated foil area to spread a thin film of solder. This will improve the circuit board ground connection after it is installed.



CONTINUE

(✓) Cut both leads of a .1 μF ceramic capacitor to a length of 3/8".



(✓) Position the capacitor exactly as shown and make sure the leads are against the foil areas they will be soldered to.

NOTE: When soldering the leads to the circuit board foils in the following step, be careful the solder does not cover any circuit board holes.

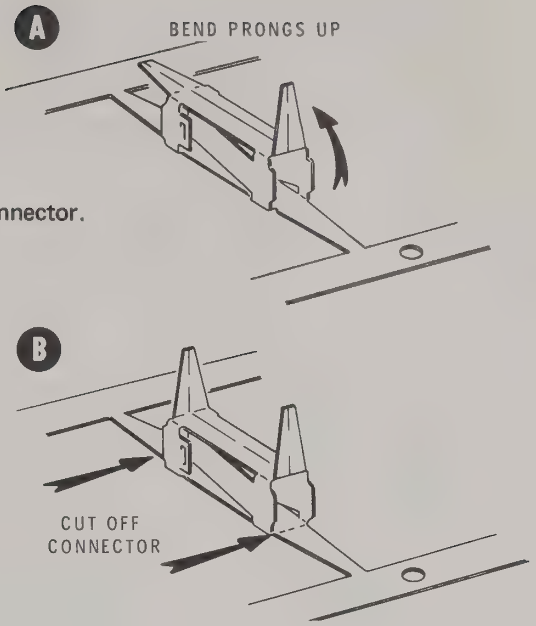
( ) Solder both capacitor leads to their indicated circuit board foils. Then press the capacitor flat against the circuit board.

This completes the assembly of this circuit board. Check to see that all connections are soldered and that the excess lead lengths are cut off. Be sure no solder bridges exist. Set the board aside until called for later.

FINISH

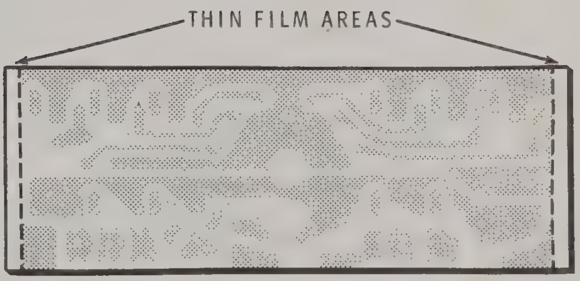
PICTORIAL 1-7

Refer to Part A and bend up both prongs of each connector. Then refer to Part B and cut off each connector.


A
BEND PRONGS UP
B
CUT OFF
CONNECTOR

PICTORIAL 2-1

Melt a small amount of solder on the indicated foil areas of the circuit board. Then slowly draw the soldering iron over the indicated foil areas to spread a thin film of solder. This will improve the Switch-Board ground connection after it is installed.

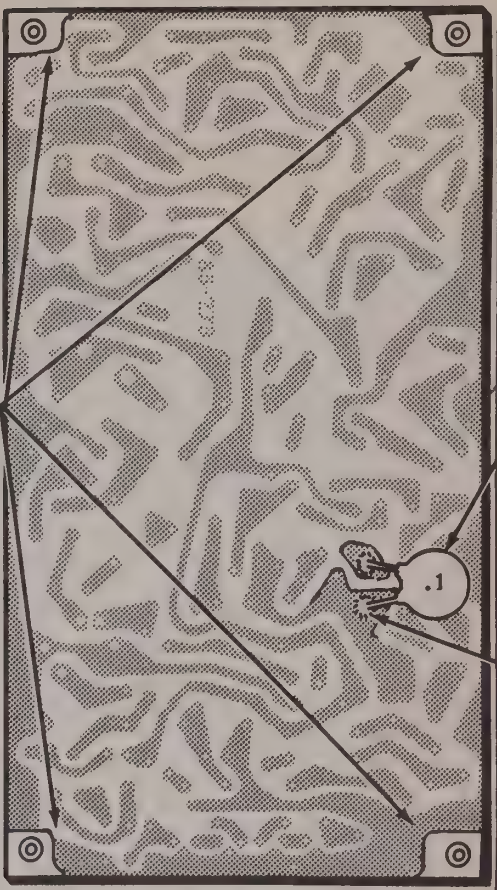

THIN FILM AREAS

PICTORIAL 2-2

START

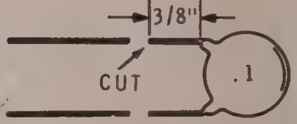
(✓) Position the circuit board with the foil side up as shown.

(✓) Melt a small amount of solder on the indicated foil area of each of the four circuit board corners. Then slowly draw the soldering iron over the indicated foil area to spread a thin film of solder. This will improve the circuit board ground connection after it is installed.



CONTINUE

(✓) Cut both leads of a .1 μF ceramic capacitor to a length of 3/8".



(✓) Position the capacitor exactly as shown and make sure the leads are against the foil areas they will be soldered to.

NOTE: When soldering the leads to the circuit board foils in the following step, be careful the solder does not cover any circuit board holes.

( ) Solder both capacitor leads to their indicated circuit board foils. Then press the capacitor flat against the circuit board.

This completes the assembly of this circuit board. Check to see that all connections are soldered and that the excess lead lengths are cut off. Be sure no solder bridges exist. Set the board aside until called for later.

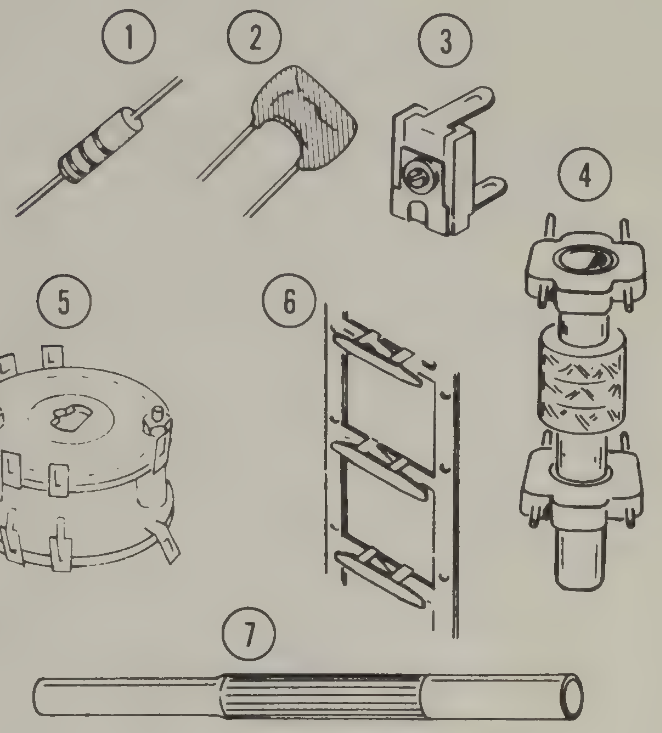
FINISH

PICTORIAL 1-7

ANTENNA SWITCH-BOARD PARTS LIST

Unpack package #2 and check each part against the following Parts List. The key numbers correspond to the numbers in the Parts Pictorial.

PARTS PICTORIAL



KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
1	1-45	1	220 Ω 1/2 watt (red-red-brown) resistor
2	20-149	1	150 pF mica capacitor
3	31-54	6	4-40 pF mica trimmer capacitor
4	40-870	1	Coil
	40-871	1	Coil
	40-872	1	Coil
	40-873	1	Coil
	40-874	1	Coil
	40-875	1	Coil
5	63-570	1	2-wafer bandswitch
6	432-77	5	Ladder of connectors (1 spare)
7	490-5	1	Nut starter
Item From Pack #6			
	85-279-1	1	Switch-Board

NOTE: The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

STEP-BY-STEP ASSEMBLY

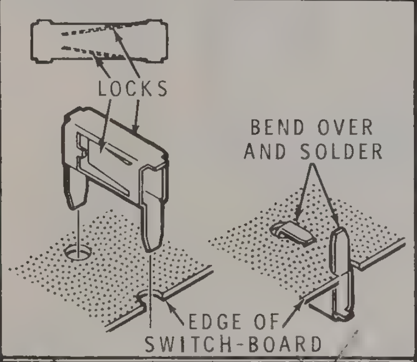
START

(✓) Refer to Pictorial 2-1 (fold-out from Page 18) and prepare four connectors as shown.

(✓) Locate the antenna Switch-Board (#85-279-1) and prepare it as shown in Pictorial 2-2 (fold-out from Page 18).

Position the antenna Switch-Board with the foil side down, as shown in Pictorial 2-3. Then, complete each step on Pictorials 2-3 through 2-6.

When installing Switch-Board connectors, insert the connector prongs through the Switch-Board so the locks of the connector are positioned as shown. Note the edge of the board. Press the connector firmly against the board and bend the prongs against the board with a screwdriver. Solder the prongs to the Switch-Board.

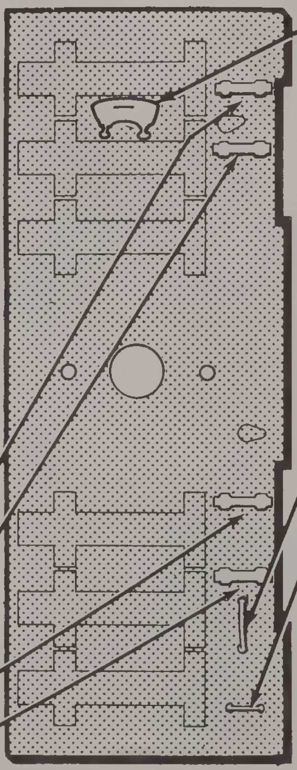


(✓) Connector.

(✓) Connector.

(✓) Connector.

(✓) Connector.



PICTORIAL 2-3

CONTINUE

(✓) 150 pF mica.

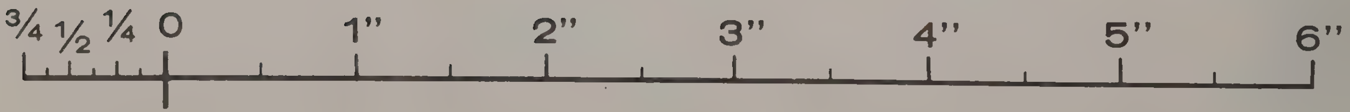
NOTE: To obtain bare wire, remove all the insulation from the indicated length of white hookup wire.

(✓) 3/4" bare wire.

(✓) 3/4" bare wire.

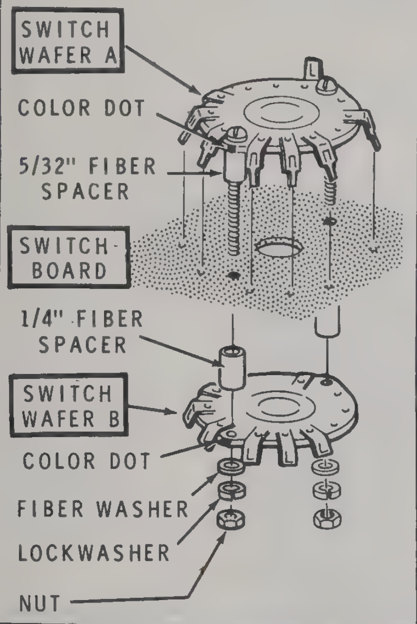
( ) Solder all connections to the foil and cut off any excess lead lengths.

PROCEED TO PICTORIAL 2-4.



START

The 2-wafer bandswitch will be partially disassembled, mounted on the Switch-Board, reassembled, and soldered in the following steps.


SWITCH WAFER A
COLOR DOT
5/32" FIBER SPACER
SWITCH-BOARD
1/4" FIBER SPACER
SWITCH WAFER B
COLOR DOT
FIBER WASHER
LOCKWASHER
NUT

(✓) Remove switch wafer B and all of the switch hardware up to but NOT INCLUDING the 5/32" fiber spacer.

(✓) Mount the remaining A wafer assembly on the lettered side of the Switch-Board. Make sure the color dots on the wafers line up. Be sure to insert the pins from the A wafer into the proper holes in the Switch-Board. Then, hold the switch assembly in place and proceed with the following steps:

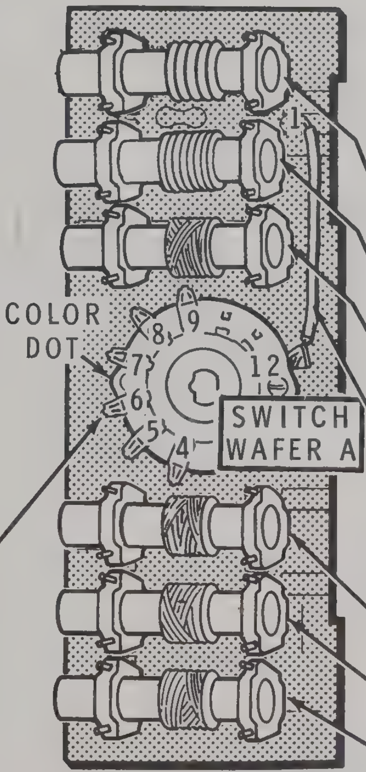
(✓) Replace two 1/4" fiber spacers.

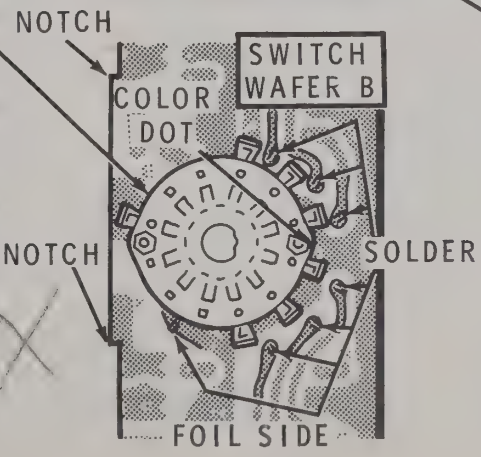
(✓) Replace switch wafer B. Be sure to position the wafer on the Switch-Board as shown.

NOTE: The plastic nut starter can be used to pick up and start 6-32 and 4-40 nuts on screws.

(✓) Replace a fiber washer, lockwasher, and a nut on each screw. Tighten the hardware.

(✓) Solder the seven pins from the A wafer to the foil.

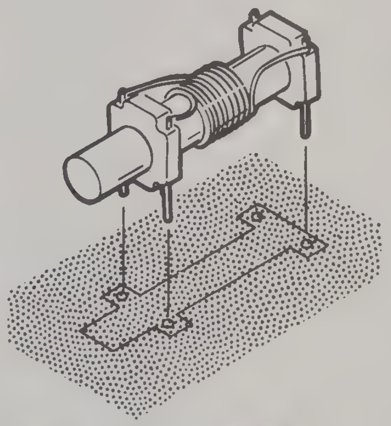

COLOR DOT
1
8
9
7
12
6
5
4
SWITCH WAFER A


NOTCH
SWITCH WAFER B
COLOR DOT
NOTCH
SOLDER
FOIL SIDE

CONTINUE

NOTE: The coils have been pretuned at the factory. Do not attempt to further adjust the coils until instructed to do so.

When installing coils on the Switch-Board, position the coil over its outline making sure all four coil pins are inserted through their Switch-Board holes. Then solder each pin. The excess pin length does not have to be cut off.



(✓) Coil (#40-875).

(✓) Coil (#40-874).

(✓) Coil (#40-873).

(✓) Connect a 2-1/4" wire from lug 12 of switch wafer A (S-1) to hole 1 in the Switch-Board (S-1). Cut off any excess lead length from hole 1.

(✓) Coil (#40-872).

(✓) Coil (#40-871).

(✓) Coil (#40-870).

( ) Check to see that all connections are soldered.

PROCEED TO PICTORIAL 2-5.

PICTORIAL 2-4

STEP-BY-STEP ASSEMBLY

START

( ) Place the Switch-Board foil side up.

( ) Connect a 220 Ω (red-red-brown) resistor from hole G (S-1) to lug 9 of switch wafer B (S-1). Position the resistor above the Switch-Board foil.

( ) Prepare the following lengths of wire:

2-1/4"	2"	1-3/4"
1-3/4"	1"	2-1/2"

Position each wire exactly as shown to allow room for the trimmer capacitors to be installed later.

NOTE: When connecting wires to the foil side of the Switch-Board, do not push the insulation tight against the foil. Leave the insulation 1/8" away from the foil to insure a good solder connection to the foil and wire.

(✓) Connect a 2-1/4" wire from hole H (S-1) to lug 8 of switch wafer B (S-1).

(✓) Connect a 1-3/4" wire from hole S (S-1) to lug 12 of switch wafer B (S-1).

(✓) Connect a 2" wire from hole J (S-1) to lug 7 of switch wafer B (S-1).

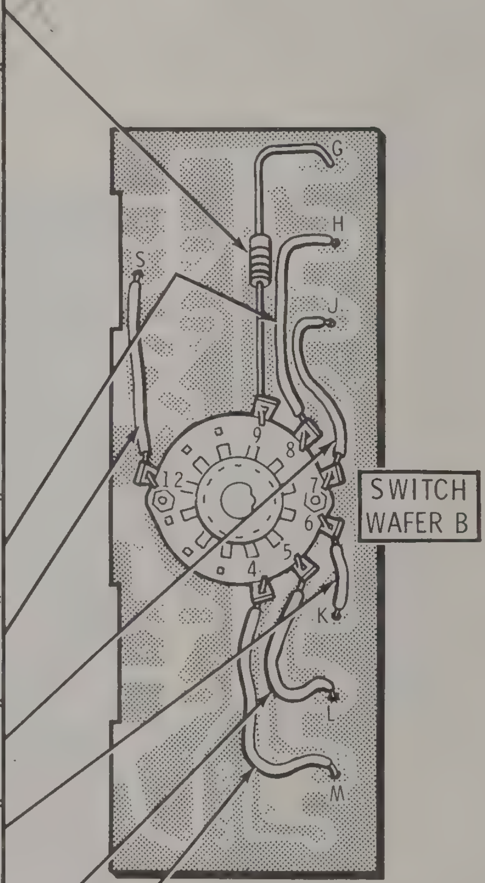
(✓) Connect a 1" wire from hole K (S-1) to lug 6 of switch wafer B (S-1).

(✓) Connect a 1-3/4" wire from hole L (S-1) to lug 5 of switch wafer B (S-1).

(✓) Connect a 2-1/2" wire from hole M (S-1) to lug 4 of switch wafer B (S-1).

( ) Check to see that all connections are soldered and cut off the excess lead lengths on both sides of the Switch-Board.

PROCEED TO PICTORIAL 2-6.



PICTORIAL 2-5

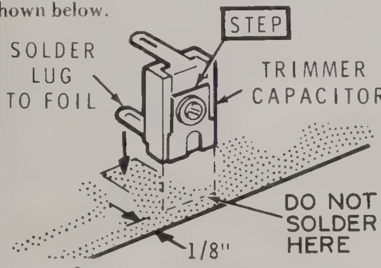
START

Six mica trimmer capacitors will be soldered to the Switch-Board foil in the following steps. Install them as follows:

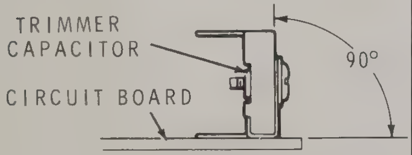
1. Heat the foil and apply a small amount of solder to the area where the capacitor will be soldered.
2. Position the trimmer as shown below, so the "step" faces up, away from the foil. Then use a pencil to mark the lug near the foil.
3. Heat the marked lug and apply a small amount of solder to it.
4. Position the trimmer on the foil as shown and solder the bottom lug to the foil.

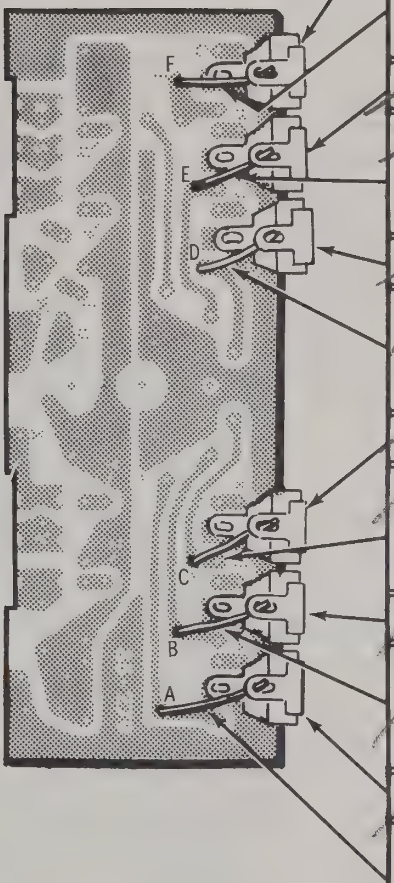
CAUTION: MAKE SURE THE TRIMMER TOUCHES ONLY THE FOIL IT IS SOLDERED TO AND NOT ANY OTHER FOIL.

NOTE: Be sure the step of the trimmer capacitor faces up, away from the foil as shown below.



After installing the trimmer capacitor, check to make sure it is at a 90 degree angle with the circuit board as shown. Bend the trimmer slightly with your finger if necessary.





CONTINUE

( ) Trimmer capacitor (4-40 pF).

(✓) Connect a 1-1/8" bare wire from hole F (S-1) to the top lug of the trimmer just installed (S-1).

(✓) Trimmer capacitor (4-40 pF).

(✓) Connect a 1-1/8" bare wire from hole E (S-1) to the top lug of the trimmer just installed (S-1).

(✓) Trimmer capacitor (4-40 pF).

(✓) Connect a 1-1/8" bare wire from hole D (S-1) to the top lug of the trimmer just installed (S-1).

( ) Trimmer capacitor (4-40 pF).

(✓) Connect a 1-1/8" bare wire from hole C (S-1) to the top lug of the trimmer just installed (S-1).

(✓) Trimmer capacitor (4-40 pF).

( ) Connect a 1-1/8" bare wire from hole B (S-1) to the top lug of the trimmer just installed (S-1).

(✓) Trimmer capacitor (4-40 pF).

(✓) Connect a 1-1/8" bare wire from hole A (S-1) to the top lug of the trimmer just installed (S-1).

NOTE: Disregard the number of unused holes on the Switch-Board.

( ) Check to see that all connections are soldered and cut off the excess lead lengths on both sides of the Switch-Board. Set the completed Switch-Board aside temporarily.

FINISH

PICTORIAL 2-6

¾ ½ ¼ 0
1"
2"
3"
4"
5"
6"

RF SWITCH-BOARD PARTS LIST

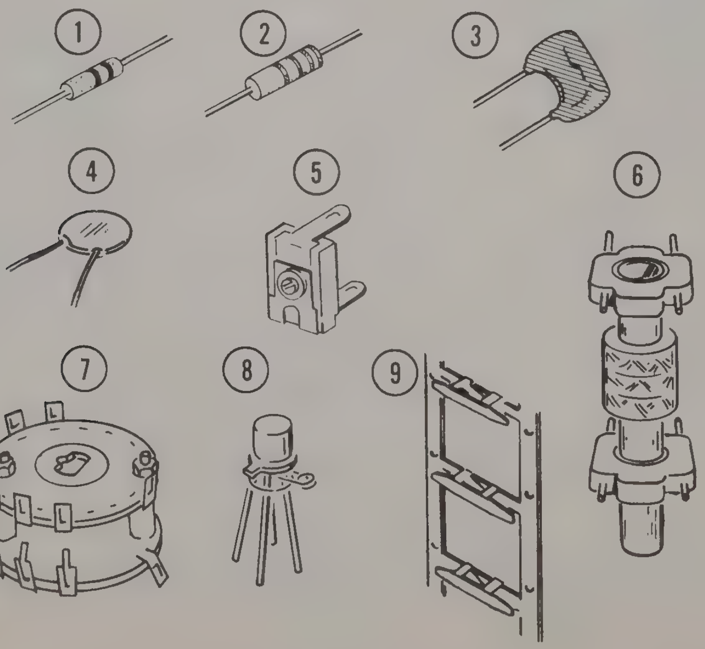
Unpack package #3 and check each part against the following Parts List. The key numbers correspond to the numbers in the Parts Pictorial.

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
1	1-1-12	2	100 Ω 1/4 watt (brown-black-brown) resistor
	1-32-12	1	100 kΩ 1/4 watt (brown-black-yellow) resistor
2	1-3	1	100 Ω 1/2 watt (brown-black-brown) resistor
3	20-130	1	12 pF mica capacitor
	20-149	1	150 pF mica capacitor
4	21-95	3	.1 μF ceramic capacitor
5	31-52	6	8-60 pF mica trimmer capacitor

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
6	40-876	1	Coil
	40-877	1	Coil
	40-878	1	Coil
	40-879	1	Coil
	40-880	1	Coil
	40-881	1	Coil
7	63-570	1	2-wafer bandswitch
8	417-274	1	40673 transistor (Do not remove the shorting spring.)
9	432-77	7	Ladder of connectors (1 spare)
Item From Pack #6			
	85-279-2	1	Switch-Board

NOTE: The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

PARTS PICTORIAL



STEP-BY-STEP ASSEMBLY

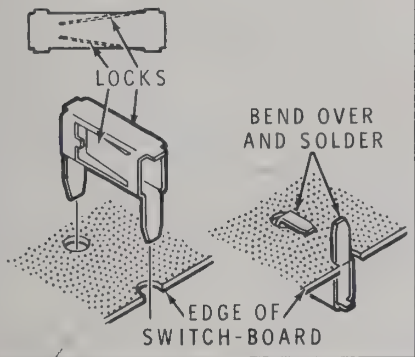
START

( ) Refer to Pictorial 2-1 (fold-out from Page 18) and prepare six connectors as shown.

( ) Locate the RF Switch-Board (#85-279-2) and prepare it as shown in Pictorial 2-2 (fold-out from Page 18).

Position the RF Switch-Board with the foil side down, as shown in Pictorial 3-1. Then complete each step on Pictorials 3-1 through 3-3.

(✓) Connector. NOTE: Solder each connector as it is installed.



(✓) Connector.

(✓) Connector.

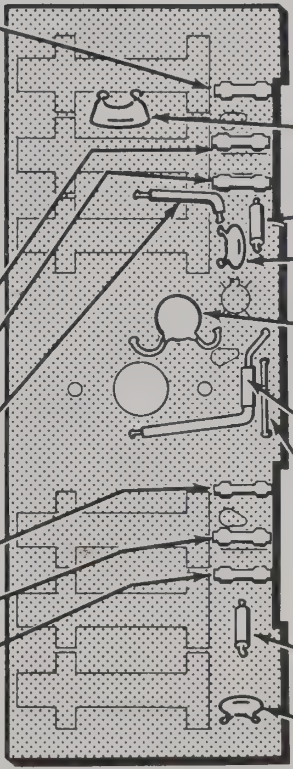
(✓) 1-1/4" hookup wire.

(✓) Connector.

(✓) Connector.

(✓) Connector.

( ) Solder all connections and cut off any excess lead lengths.



CONTINUE

(✓) 150 pF mica.

(✓) 100 Ω 1/4 watt (brown-black-brown).

(✓) .1 µF ceramic.

(✓) .1 µF ceramic. Position the capacitor as shown and press it flat against the Switch-Board.

(✓) Remove 1" of insulation from the hookup wire.

(✓) Place the 1" length of insulation on one lead of a 100 kΩ 1/4 watt (brown-black-yellow) resistor. Position the resistor as shown.

(✓) 1" bare wire.

(✓) 100 Ω 1/4 watt (brown-black-brown).

(✓) .1 µF ceramic.

( ) Solder all connections and cut off any excess lead lengths.

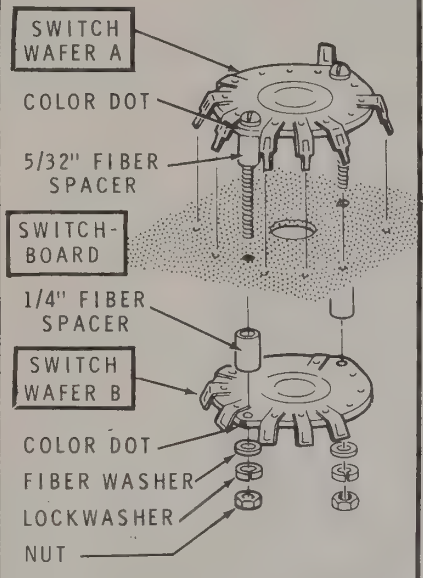
PROCEED TO PICTORIAL 3-2.

PICTORIAL 3-1

3/4
1/2
1/4
0
1"
2"
3"
4"
5"
6"

START

The 2-wafer bandswitch will be partially disassembled, mounted on the Switch-Board, reassembled, and soldered in the following steps.


SWITCH WAFER A
COLOR DOT
5/32" FIBER SPACER
SWITCH-BOARD
1/4" FIBER SPACER
SWITCH WAFER B
COLOR DOT
FIBER WASHER
LOCKWASHER
NUT

(✓) Remove switch wafer B and all of the switch hardware up to but NOT INCLUDING the 5/32" fiber spacer.

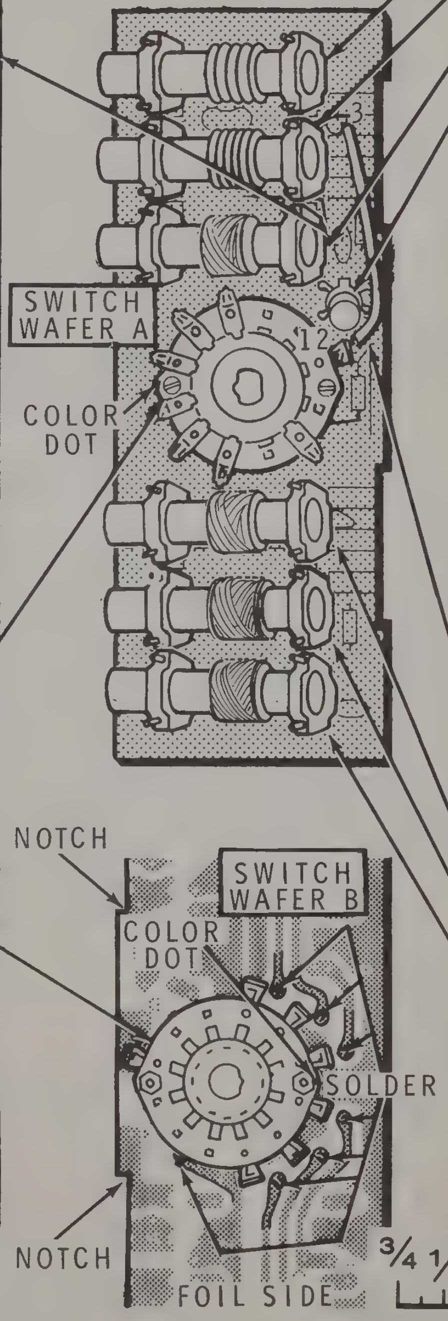
(✓) Mount the remaining A wafer assembly on the lettered side of the Switch-Board. Make sure the color dots on the wafer line up. Be sure to insert the pins from the A wafer into the proper holes in the Switch-Board. Then, hold the switch assembly in place and proceed with the following steps.

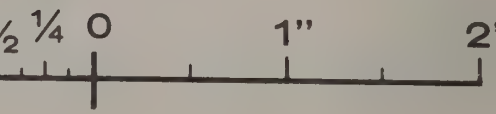
(✓) Replace two 1/4" fiber spacers.

(✓) Replace switch wafer B. Be sure to position the wafer on the Switch-Board as shown.

(✓) Replace a fiber washer, lockwasher, and a nut on each screw. Tighten the hardware.

(✓) Solder the seven pins from the A wafer to the foil.


3
SWITCH WAFER A
12
COLOR DOT
NOTCH
SWITCH WAFER B
COLOR DOT
SOLDER
NOTCH
FOIL SIDE



CONTINUE

NOTE: The coils have been pretuned at the factory. Do not attempt to further adjust the coils until instructed to do so. Solder the connections of each coil as it is installed.

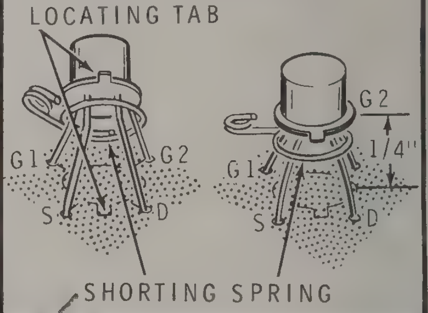
(✓) Coil (#40-881).

(✓) Coil (#40-880).

(✓) Coil (#40-879).

NOTE: Do not remove the shorting spring when you install the transistor in the next step.

(✓) Install the 40673 (#417-274) transistor in the following manner: Line up the locating tab of the transistor with the tab outline on the Switch-Board. Then insert the transistor leads into their Switch-Board holes which are indicated by S, G1, G2, and D. Position the transistor 1/4" above the Switch-Board. Solder each lead to the foil and cut off the excess lead lengths.


LOCATING TAB
G1
G2
S
D
G2
1/4"
G1
S
D
SHORTING SPRING

(✓) Connect a 2-1/4" wire from lug 12 of switch wafer A (S-1) to hole 3 in the Switch-Board (S-1). Cut off any excess lead length from hole 3.

(✓) Coil (#40-878).

(✓) Coil (#40-877).

(✓) Coil (#40-876).

( ) Check that all connections are soldered.

PROCEED TO PICTORIAL 3-3.

PICTORIAL 3-2

START

( ) Place the Switch-Board foil side up.

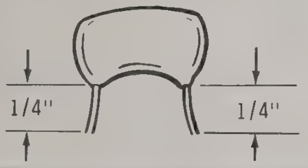
( ) Prepare the following lengths of wire:

~~2-3/4"~~
~~2-1/2"~~
2"
1-1/4"
~~2"~~
2-1/4"

Position each wire length exactly as shown to allow room for the trimmer capacitors to be installed later.

( ) Connect a 2-3/4" wire from hole G (S-1) to lug 9 of switch wafer B (S-1).

( ) Prepare a 12 pF mica capacitor as shown.



NOTE: Some locations may not have holes, as in the next step. Solder the lead directly to the indicated foil.

( ) Connect this capacitor from foil R (S-1) to hole S (S-1). Position as shown on Pictorial.

( ) Connect a 2-1/2" wire from hole H (S-1) to lug 8 of switch wafer B (S-1).

( ) Connect a 2" wire from hole J (S-1) to lug 7 of switch wafer B (S-1).

( ) Connect a 1-1/8" bare wire from hole T (S-1) to lug 12 of switch wafer B (S-1).

( ) Connect a 100 Ω (brown-black-brown) resistor from hole U (S-1) to hole V (S-1). Position the resistor 1/4" above the Switch-Board so it does not touch any other foils.

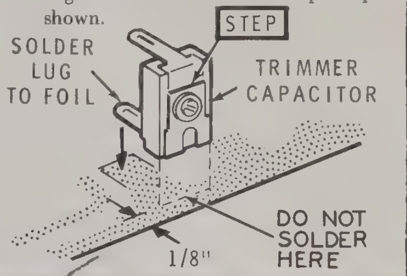
( ) Connect a 1-1/4" wire from hole K (S-1) to lug 6 of switch wafer B (S-1).

( ) Connect a 2" wire from hole L (S-1) to lug 5 of switch wafer B (S-1).

( ) Connect a 2-1/4" wire from hole M (S-1) to lug 4 of switch wafer B (S-1).

CONTINUE

( ) Trimmer capacitor (8-60 pF). Refer to Page 21 and be sure the step is up as shown.



( ) Connect a 1-1/8" bare wire from hole F (S-1) to the top lug of the trimmer just installed (S-1).

( ) Trimmer capacitor (8-60 pF).

( ) Connect a 1-1/8" bare wire from hole E (S-1) to the top lug of the trimmer just installed (S-1).

( ) Trimmer capacitor (8-60 pF).

( ) Connect a 1-1/8" bare wire from hole D (S-1) to the top lug of the trimmer just installed (S-1).

( ) Trimmer capacitor (8-60 pF).

( ) Connect a 1-1/8" bare wire from hole C (S-1) to the top lug of the trimmer just installed (S-1).

( ) Trimmer capacitor (8-60 pF).

( ) Connect a 1-1/8" bare wire from hole B (S-1) to the top lug of the trimmer just installed (S-1).

( ) Trimmer capacitor (8-60 pF).

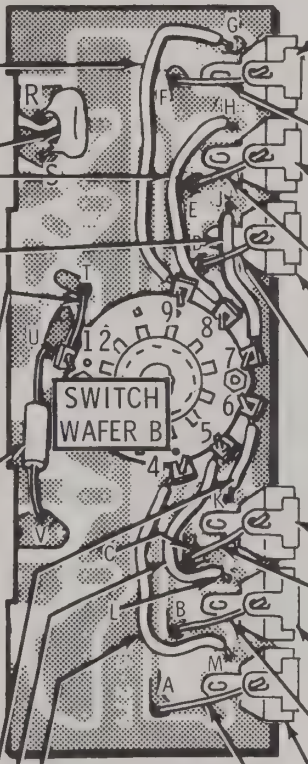
( ) Connect a 1-1/8" bare wire from hole A (S-1) to the top lug of the trimmer just installed (S-1).

NOTE: Disregard the number of unused holes on the Switch-Board.

( ) Check to see that all connections are soldered and cut off any excess lead lengths.

( ) Set the completed Switch-Board aside temporarily.

FINISH



PICTORIAL 3-3

MIXER SWITCH-BOARD PARTS LIST

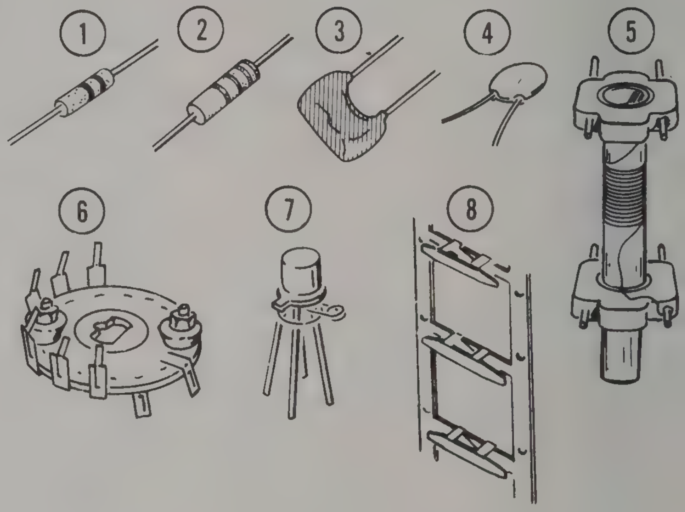
Unpack package #4 and check each part against the following Parts List. The key numbers correspond to the numbers in the Parts Pictorial.

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
1	1-1-12	~~2~~	100 Ω 1/4 watt (brown-black brown) resistor
	1-26-12	~~1~~	5600 Ω 1/4 watt (green-blue-red) resistor
	1-45-12	~~1~~	22 kΩ 1/4 watt (red-red-orange) resistor
	1-32-12	~~1~~	100 kΩ 1/4 watt (brown-black-yellow) resistor
2	1-21	~~1~~	15 kΩ 1/2 watt (brown-green-orange) resistor
3	20-149	~~1~~	150 pF mica capacitor
	20-111	~~1~~	230 pF mica capacitor
	20-128	~~1~~	470 pF mica capacitor
4	21-143	~~1~~	.05 μF ceramic capacitor
	21-95	~~2~~	.1 μF ceramic capacitor
5	40-650	~~1~~	Coil
	40-888	~~1~~	Coil
	40-889	~~1~~	Coil
6	63-546	~~1~~	Single wafer bandswitch
7	417-274	~~1~~	40673 transistor (Do not remove the shorting spring.)
8	432-77	~~6~~	Ladder of connectors (1 spare)

Item From Pack #6

85-279-12	1	Switch-Board

PARTS PICTORIAL



NOTE: The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

3/4
1/2
1/4
0
1"
2"
3"
4"
5"
6"

STEP-BY-STEP ASSEMBLY

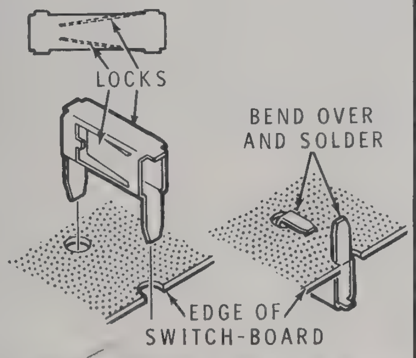
START

( ) Refer to Pictorial 2-1 (fold-out from Page 18) and prepare five connectors as shown.

( ) Locate the mixer Switch-Board (#85-279-12) and prepare it as shown in Pictorial 2-2 (fold-out from Page 18).

Position the mixer Switch-Board with the foil side down, as shown in Pictorial 4-1. Then, complete each step on Pictorials 4-1 through 4-3.

(✓) Connector. NOTE: Solder each connector as it is installed.



(✓) Connector.

(✓) 3/4" bare wire.

(✓) 1-1/4" bare wire.

(✓) 1-1/4" bare wire.

(✓) Connector.

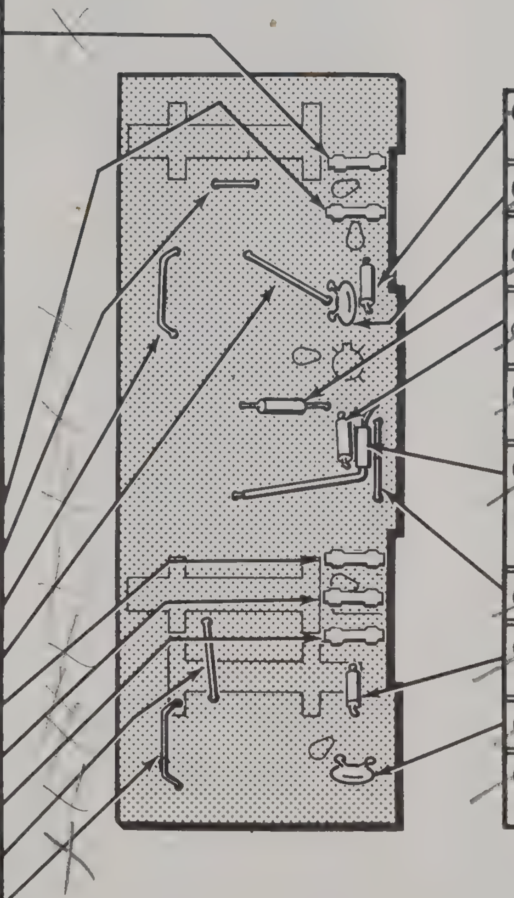
(✓) Connector.

(✓) Connector.

(✓) 1" bare wire.

(✓) 1-1/4" bare wire.

( ) Solder all connections and cut off any excess lead lengths.



CONTINUE

(✓) 100 Ω 1/4 watt (brown-black-brown).

(✓) .1 μF ceramic.

(✓) 5600 Ω 1/4 watt (green-blue-red).

(✓) 22 kΩ 1/4 watt (red-red-orange).

(✓) Remove 1" of insulation from the hookup wire.

(✓) Place the 1" length of insulation on one lead of a 100 kΩ 1/4 watt (brown-black-yellow) resistor. Install the resistor as shown.

(✓) 1" bare wire.

(✓) 100 Ω 1/4 watt (brown-black-brown).

(✓) .1 μF ceramic.

(✓) Solder all connections and cut off any excess lead lengths.

PROCEED TO PICTORIAL 4-2.

PICTORIAL 4-1

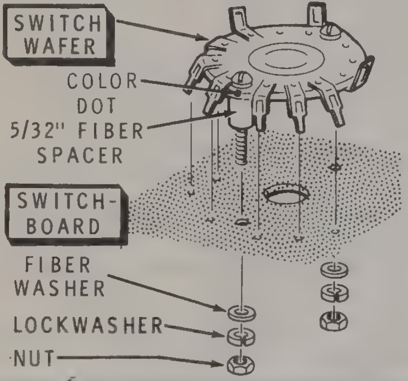
START

NOTE: The coils have been pretuned at the factory. Do not attempt to further adjust the coils until instructed to do so.

(✓) Coil (#40-889).

(✓) Connect a 150 pF mica capacitor between pins 3 (S-1) and 4 (S-1) of the coil just installed. Position as shown.

The single wafer bandswitch will be partially disassembled, mounted on the Switch-Board and reassembled in the following steps.



(✓) Remove all of the switch hardware up to but NOT INCLUDING the 5/32" fiber spacer.

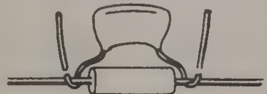
(✓) Mount the wafer assembly on the lettered side of the Switch-Board. Be sure to insert the pins from the wafer into the proper holes in the Switch-Board. Then, hold the switch assembly in place and proceed with the following steps.

(✓) Replace a fiber washer, lockwasher, and a nut on each screw. Tighten the hardware.

(✓) Solder the six switch wafer pins to the foil.

(✓) Coil (#40-888).

(✓) Prepare a 15 kΩ 1/2 watt (brown-green-orange) resistor and a 470 pF mica capacitor combination as shown. Then connect the combination between pins 1 (S-1) and 4 (S-1) of the coil just installed. Position the combination down along the side of the coil as shown.



CONTINUE

(✓) Prepare the following lengths of wire:
2-1/2" 2-1/4"

(✓) Connect the 2-1/2" wire from hole 3 (S-1) to lug 12 of the wafer (S-1).

(✓) Remove 5/8" of insulation from the hookup wire.

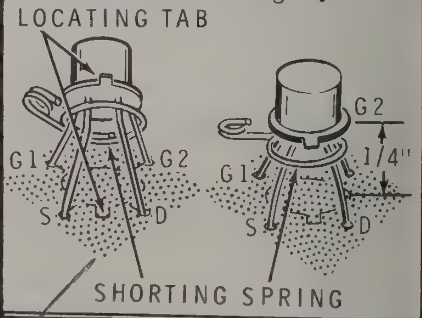
(✓) Place the 5/8" length of insulation on one lead of a .05 μF ceramic capacitor. Connect this lead to hole 2 in the Switch-Board (S-1).

(✓) Connect the other lead of this capacitor to lug 10 of the wafer (NS).

(✓) Connect a 1" length of bare wire from hole 1 (S-1) to lug 10 of the wafer (S-2).

NOTE: Do not remove the shorting spring when you install the transistor in the next step.

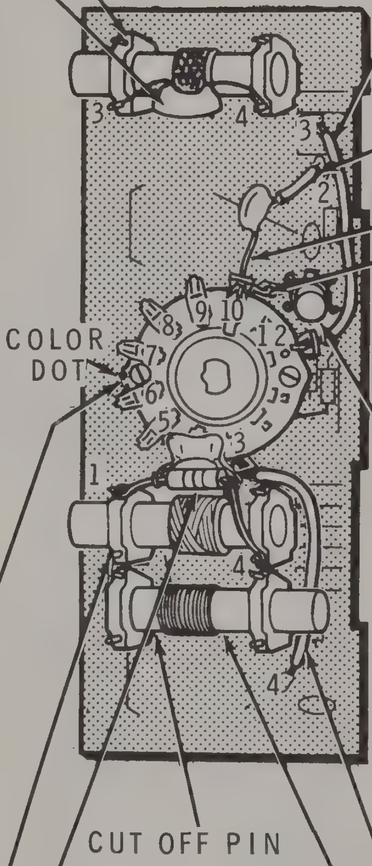
(✓) Install the 40673 (#417-274) transistor in the following manner: Line up the tab of the transistor with the tab outline on the Switch-Board. Then insert the transistor leads into their Switch-Board holes which are indicated by S, G1, G2, and D. Position the transistor 1/4" above the Switch-Board. Solder each lead to the foil and cut off the excess lead lengths.



(✓) Connect a 2-1/4" wire from hole 4 (S-1) to lug 3 of the wafer (S-1).

(✓) Locate the #40-650 coil and cut off the indicated pin. Then install the coil as shown.

(✓) Check to see that all connections are soldered and cut off any excess lead lengths.



PICTORIAL 4-2

PROCEED TO PICTORIAL 4-3.

START

( ) Place the board foil side up.

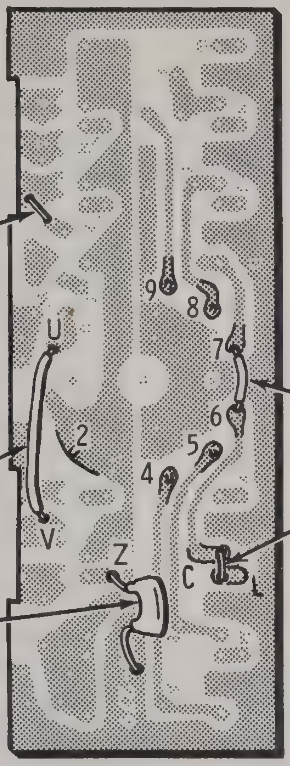
( ) Solder a 1/2" length of bare wire between the foil sections as shown.

( ) Prepare the following lengths of wire:

2"
1"

(✓) Solder the 2" wire from foil section U (S-1) to foil section V (S-1).

(✓) Cut both leads of a 230 pF mica capacitor to a length of 3/8". Solder one lead to hole Z and the other lead directly to the indicated foil.



CONTINUE

(✓) Connect a 1" wire from pin 6 (S-1) to pin 7 (S-1).

(✓) 1/2" bare wire.

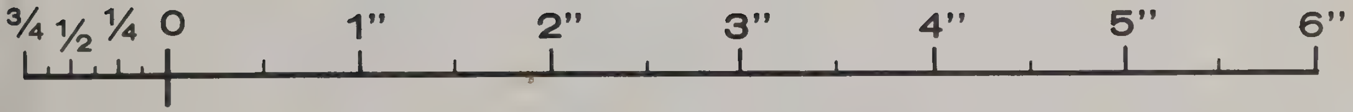
NOTE: Disregard the unused holes on the Switch-Board.

( ) Check to see that all connections are soldered and cut off any excess lead lengths.

( ) Set the completed Switch-Board aside temporarily.

FINISH

PICTORIAL 4-3



OSCILLATOR SWITCH-BOARD PARTS LIST

Unpack package #5 and check each part against the following Parts List. The key numbers correspond to the numbers in the Parts Pictorial.

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
1	1-1-12	1	100 Ω 1/4 watt (brown-black-brown) resistor
	1-18-12	1	470 kΩ 1/4 watt (yellow-violet-yellow) resistor
2	1-18	1	5600 Ω 1/2 watt (green-blue-red resistor
	1-44	1	2200 Ω 1/2 watt (red-red-red) resistor
3	20-130	1	12 pF mica capacitor
	20-102	2	100 pF mica capacitor
	20-111	1	230 pF mica capacitor
	20-128	1	470 pF mica capacitor
	20-127	1	1300 pF mica capacitor
	20-129	1	2700 pF mica capacitor
4	21-95	2	.1 μF ceramic capacitor
5	31-56	2	1.5-20 pF mica trimmer capacitor
	31-54	3	4-40 pF mica trimmer capacitor
	31-52	1	8-60 pF mica trimmer capacitor

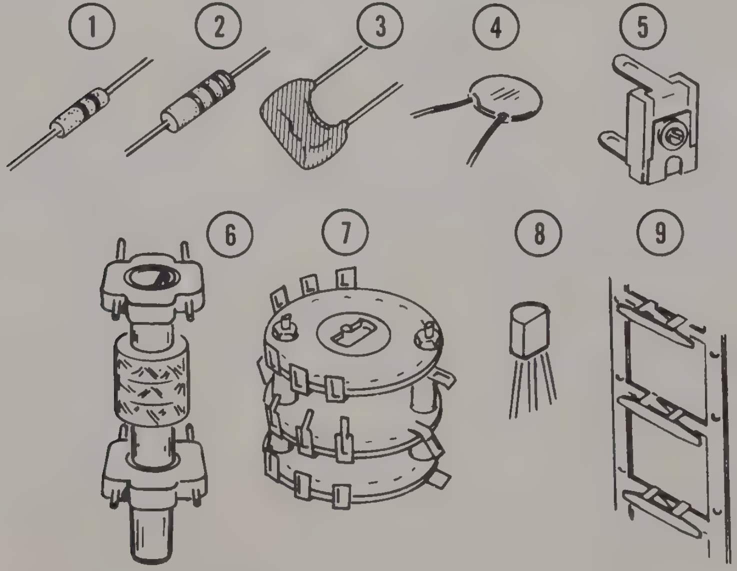
KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
6	40-882	1	Coil
	40-883	1	Coil
	40-884	1	Coil
	40-885	1	Coil
	40-1003	1	Coil
	40-887	1	Coil
7	63-571	1	3-wafer bandswitch
8	417-169	1	MPF105 transistor
9	432-77	4	Ladder of connectors

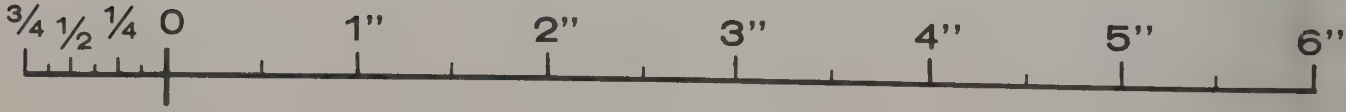
Item From Pack #6

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
	85-279-13	1	Switch-Board

NOTE: The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

PARTS PICTORIAL





STEP-BY-STEP ASSEMBLY

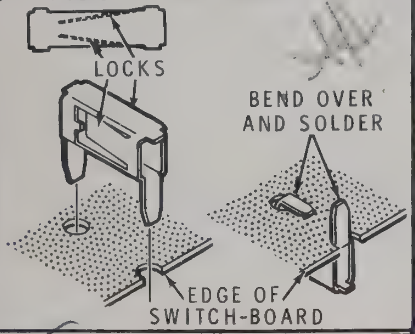
START

( ) Refer to Pictorial 2-1 (fold-out from Page 18) and prepare four connectors as shown.

( ) Locate the oscillator Switch-Board (#85-279-13) and prepare it as shown in Pictorial 2-2 (fold-out from Page 18).

Position the oscillator Switch-Board with the lettered side up, as shown in Pictorial 5-1. Then, complete each step on Pictorials 5-1 through 5-5.

(✓) Connector. Solder each connector as it is installed.



(✓) 3/4" bare wire.

(✓) Connector.

(✓) Prepare the following lengths of wire: 1-1/2"
3-3/8"

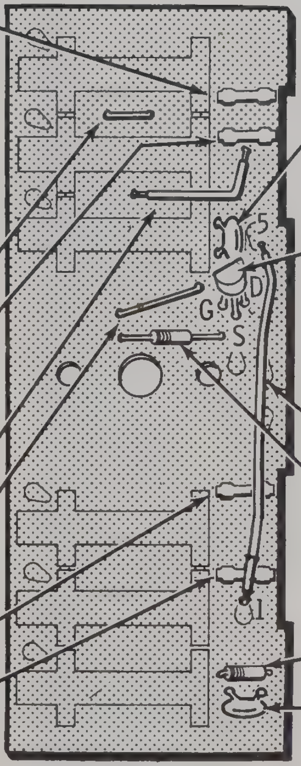
(✓) 1-1/2" wire.

(✓) 1" bare wire.

(✓) Connector.

(✓) Connector.

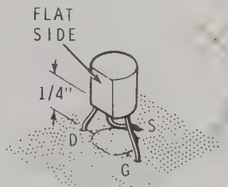
(✓) Solder all connections to the foil and cut off any excess lead lengths.



CONTINUE

(✓) .1 μF ceramic.

(✓) Bend each transistor lead as shown. Then insert the leads into their Switch-Board holes indicated by D, S, and G. Solder each lead to the foil. Cut off the excess lead lengths.



(✓) 3-3/8" wire from hole 5 to hole 1.

(✓) 470 kΩ 1/4 watt (yellow-violet-yellow).

(✓) 100 Ω 1/4 watt (brown-black-brown).

(✓) .1 μF ceramic.

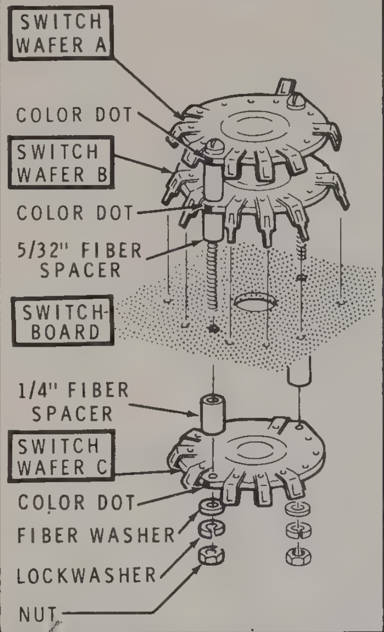
(✓) Check to see that all connections are soldered and cut off any excess lead lengths.

PICTORIAL 5-1

PICTORIAL 5-2

START

The 3-wafer bandswitch will be partially disassembled, mounted on the Switch-Board, reassembled, and soldered in the following steps.


SWITCH WAFER A
COLOR DOT
SWITCH WAFER B
COLOR DOT
5/32" FIBER SPACER
SWITCH-BOARD
1/4" FIBER SPACER
SWITCH WAFER C
COLOR DOT
FIBER WASHER
LOCKWASHER
NUT

( ) Remove switch wafer C and all of the switch hardware up to but NOT INCLUDING the 5/32" fiber spacer.

( ) Mount the remaining A and B wafer assembly on the lettered side of the Switch-Board. Be sure to insert the pins from wafer B into the proper holes in the Switch-Board. Then, hold the switch assembly in place and proceed with the following steps.

( ) Replace two 1/4" fiber spacers.

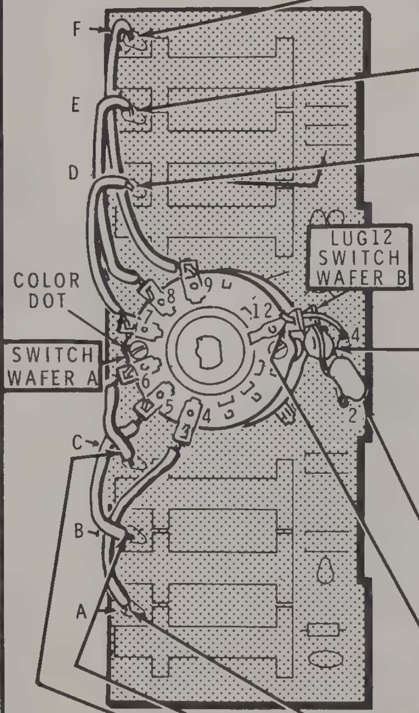
( ) Replace switch wafer C. Be sure to position the wafer on the Switch-Board as shown. Be sure the color dots on the wafer are lined up with each other.

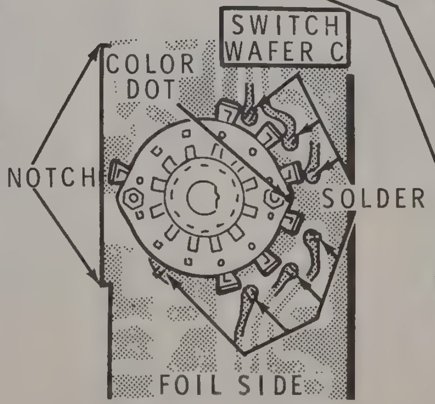
( ) Replace a fiber washer, lockwasher, and a nut on each screw. Tighten the hardware.

( ) Solder the seven pins from wafer B to the foil.

Prepare the following lengths of wire:

2-3/4"	1"	1-3/4"
2-1/4"	2-1/2"	1-1/4"
1-3/4"		


F
E
D
C
B
A
COLOR DOT
SWITCH WAFER A
LUG12 SWITCH WAFER B
9
8
7
6
5
4
3
12
4
2


SWITCH WAFER C
COLOR DOT
NOTCH
SOLDER
FOIL SIDE

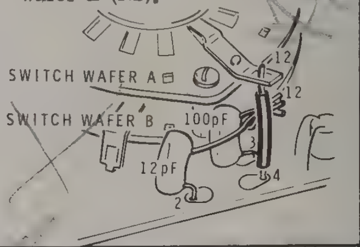
CONTINUE

( ) Connect a 2-3/4" wire from hole F in the Switch-Board (S-1) to lug 9 of switch wafer A (S-1).

( ) Connect the 2-1/4" wire from hole E in the Switch-Board (S-1) to lug 8 of switch wafer A (S-1).

( ) Connect 1-3/4" wire from hole D in the Switch-Board (S-1) to lug 7 of switch wafer A (S-1).

( ) Connect a 100 pF mica capacitor from hole 3 in the Switch-Board (S-1) to lug 12 of switch wafer B (NS).


SWITCH WAFER A
SWITCH WAFER B
100pF
12pF
12
12
3
4
2

( ) Connect a 12 pF mica capacitor from hole 2 in the Switch-Board (S-1) to lug 12 of switch wafer B (S-2).

( ) Connect a 1" wire from hole 4 in the Switch-Board (S-1) to lug 12 of switch wafer A (S-1).

( ) Connect a 2-1/2" wire from hole A in the Switch-Board (S-1) to lug 4 of switch wafer A (S-1).

( ) Connect a 1-3/4" wire from hole B in the Switch-Board (S-1) to lug 5 of switch wafer A (S-1).

( ) Connect a 1-1/4" wire from hole C in the Switch-Board (S-1) to lug 6 of switch wafer A (S-1).

( ) Check to see that all connections are soldered and cut off any excess lead lengths.

PROCEED TO PICTORIAL 5-3

START

NOTE: The coils have been pretuned at the factory. Do not attempt to adjust the coils until instructed to do so.

( ) Coil (#40-887).

( ) Cut both leads of a 2200 Ω 1/2 watt (red-red-red) resistor to 1/2". Connect this resistor between lugs 3 (S-1) and 4 (S-1) of the coil just installed.

( ) Coil (#40-1003).

( ) Cut both leads of a 5600 Ω 1/2 watt (green-blue-red) resistor to 1/2". Connect this resistor between lugs 3 (S-1) and 4 (S-1) of the coil just installed.

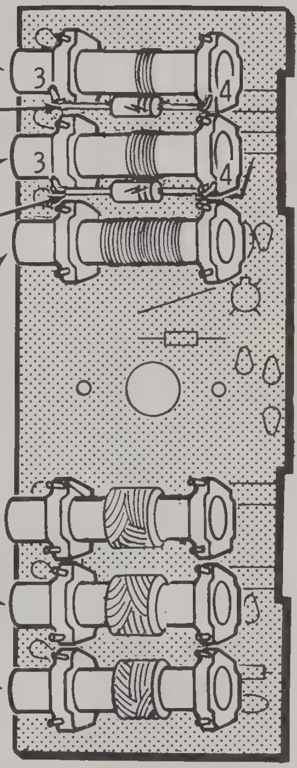
( ) Coil (#40-885).

( ) Coil (#40-884).

( ) Coil (#40-883).

( ) Coil (#40-882).

PROCEED TO PICTORIAL 5-4.



PICTORIAL 5-3

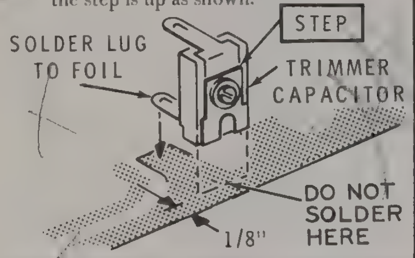
3/4
1/2
1/4
0
1"
2"
3"
4"
5"
6"

START

( ) Place the board foil side up.

NOTE: Trimmer capacitors of several different values are installed in the following steps. Be sure to install the correct trimmers at each location.

(✓) Trimmer capacitor (1.5 – 20 pF). Refer to Page 21 for installation and be sure the step is up as shown.



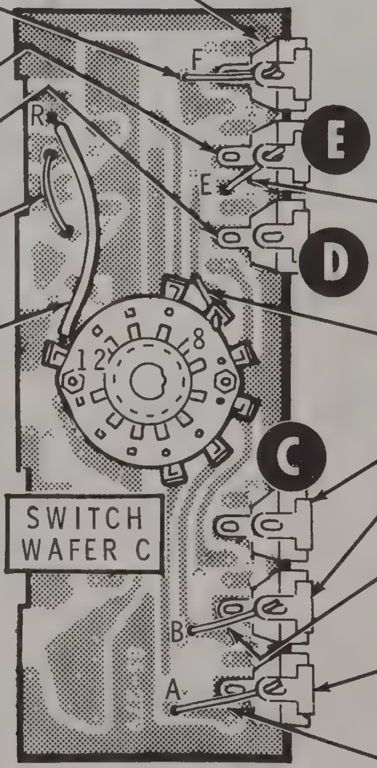
(✓) Connect a 1-1/8" length of bare wire from hole F (S-1) to the top lug of the trimmer just installed (S-1).

(✓) Trimmer capacitor (1.5-20 pF).

(✓) Trimmer capacitor (4-40 pF).

( ) Solder both ends of a 3/4" bare wire directly to the indicated Switch-Board foils.

(✓) Prepare a 2" length of wire. Connect the wire from hole R in the Switch-Board (S-1) to lug 12 of switch wafer C (S-1).



CONTINUE

(✓) Connect a 1-1/8" length of bare wire from hole E (S-1) to the top lug of trimmer E (S-1).

(✓) Connect a 3/4" length of bare wire from lug 8 of switch wafer C (S-1) to the indicated Switch-Board foil (S-1).

( ) Trimmer capacitor (4-40 pF).

(✓) Trimmer capacitor (4-40 pF).

( ) Connect a 1-1/8" length of bare wire from hole B (S-1) to the top lug of the trimmer just installed (S-1).

(✓) Install the 8-60 pF trimmer capacitor.

(✓) Connect a 1-1/8" length of bare wire from hole A (S-1) to the top lug of the trimmer just installed (S-1).

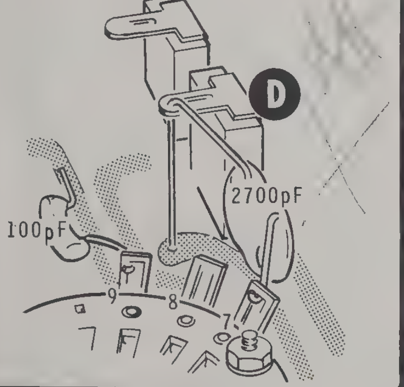
( ) Check to see that all connections are soldered and cut off any excess lead lengths.

PICTORIAL 5-4

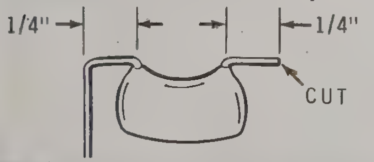
PROCEED TO PICTORIAL 5-5.

START

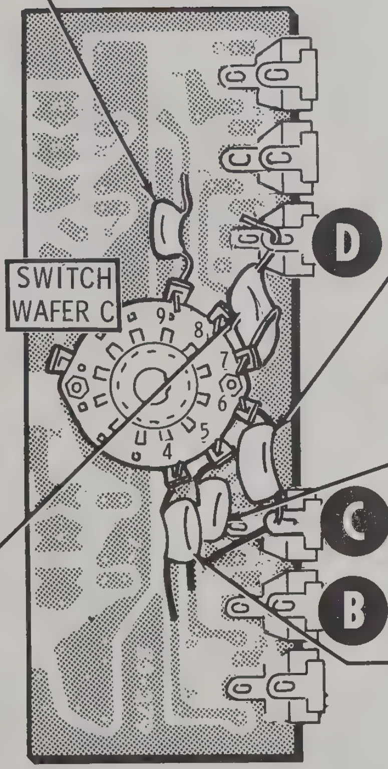
(✓) Cut both leads of a 100 pF mica capacitor to a length of 3/8". Connect one lead to lug 9 of switch wafer C (S-1). Position the capacitor as shown and press the other lead flat against the Switch-Board foil and solder it to the foil.



(✓) Cut one lead of the 2700 pF mica capacitor to a length of 1/4". Bend both leads as shown.



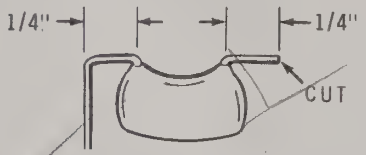
(✓) Install the 2700 pF mica capacitor by first inserting the long capacitor lead through the top lug of trimmer D and into Switch-Board hole D (S-1). Solder the lead to the trimmer lug. Then, connect the free 1/4" lead to lug 7 of switch wafer C (S-1).



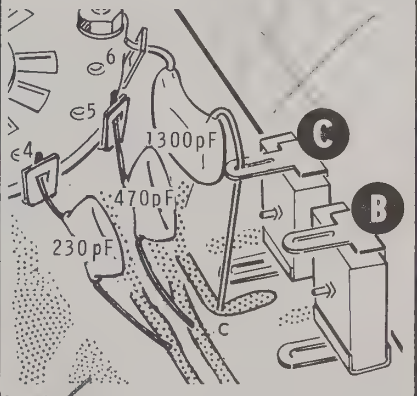
PICTORIAL 5-5

CONTINUE

(✓) Cut one lead of the 1300 pF mica capacitor to a length of 1/4". Bend both leads as shown.



(✓) Install the 1300 pF mica capacitor by first inserting the long capacitor lead through the top lug of trimmer C and into Switch-Board hole C (S-1). Solder the lead to the trimmer lug. Then, connect the free 1/4" lead to lug 6 of switch wafer C (S-1).



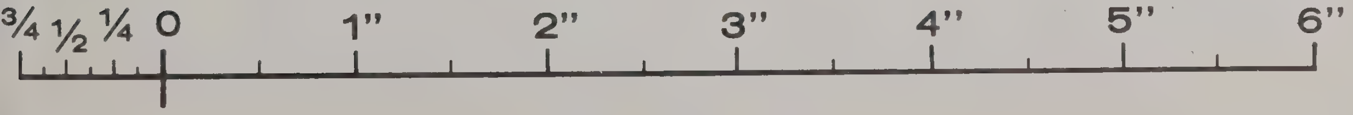
(✓) Cut both leads of the 470 pF mica capacitor to a length of 3/8". Connect one lead to lug 5 of switch wafer C (S-1). Position the capacitor as shown and press the other lead against the Switch-Board foil and solder it.

(✓) Cut both leads of the 230 pF mica capacitor to a length of 3/8". Connect one lead to lug 4 of switch wafer C (S-1). Position the capacitor as shown and press the other lead against the Switch-Board foil and solder it.

NOTE: Disregard the unused holes on the Switch-Board.

(✓) Check to see that all connections are soldered.

(✓) Set the completed Switch-Board aside temporarily.



CHASSIS

PARTS LIST

Unpack the remaining parts packages and check each part against the following Parts List. The key numbers correspond to the numbers in the Parts Pictorial (fold-out from Page 39).

1/2 WATT RESISTORS-CONTROL

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
1	1-103	1	33 Ω (orange-orange-black)
	1-1	1	47 Ω (yellow-violet-black)
	1-2	1	68 Ω (blue-gray-black)
	1-3	1	100 Ω (brown-black-brown)
	1-9	1	1000 Ω (brown-black-red)
	1-20	1	10 kΩ (brown-black-orange)
2	14-7	1	50 kΩ and 5 kΩ dual control with SPST switch

CAPACITORS

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
3	20-130	1	12 pF mica
	20-102	1	100 pF mica
4	21-71	2	.001 μF 1.4 kV ceramic
	21-143	1	.05 μF ceramic
5	25-98	1	50 μF electrolytic
6	25-123	1	2 μF electrolytic
7	25-157	1	500 μF electrolytic
8	28-2	1	1.0 pF phenolic (brown-black-white-silver)
9	26-143	1	290-290-259 pF variable (tuning)
10	26-127	1	7-18.7 μF variable (bandspread)

DIODE LAMPS

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
11	57-65	3	Silicon diode
12	412-17	1	#53 lamp
13	412-31	2	#2114D lamp

SWITCHES-TRANSFORMER

KEY No.	PART No,	PARTS Per Kit	DESCRIPTION
14	60-48	5	DPDT rocker switch
15	60-46	1	SPST rocker switch with spring return
16	54-226	1	Power transformer

GROMMETS-CLAMP

KEY No.	PART No,	PARTS Per Kit	DESCRIPTION
17	73-4	5	5/16" rubber grommet
18	73-27	2	1/2" plastic grommet
19	73-52	2	1/4" plastic grommet
20	207-58	2	Battery clamp

JACK-SOCKETS-PLUG

KEY No.	PART No,	PARTS Per Kit	DESCRIPTION
21	436-4	1	3-terminal phone jack
22	432-4	1	AC power plug
23	434-88	1	Lamp socket
24	432-32	1	2-terminal polarized socket
25	432-29	1	2-terminal polarized plug

CONNECTORS-TERMINAL STRIPS

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
26	432-102	~~8~~	5-pin Switch-Board connector
27	431-2	~~1~~	2-lug terminal strip
28	431-6	~~2~~	2-lug screw type terminal strip
29	431-16	~~1~~	2-lug terminal strip
30	431-40	~~2~~	4-lug terminal strip
31	431-62	~~3~~	3-lug miniature terminal strip

HARDWARE

#4 Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
32	250-156	1	4-40 x 1/8″ setscrew
33	250-3	2	4-40 x 3/16″ screw
34	250-52	17	4-40 x 1/4″ screw
35	250-4	2	4-40 x 3/8″ screw
36	252-2	7	4-40 nut
37	254-9	7	Small lockwasher

#6 Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
38	250-138	3	6-32 x 3/16″ screw
39	250-116	4	6-32 x 1/4″ black screw
40	250-56	30	6-32 x 1/4″ screw
41	250-170	35	#6 x 1/4″ sheet metal screw
42	250-432	6	6-32 x 5/16″ screw
43	250-100	2	6-32 x 5/16″ setscrew
44	250-89	11	6-32 x 3/8″ screw
45	250-32	2	6-32 x 3/8″ flat head screw
46	250-162	3	6-32 x 1/2″ screw
47	252-3	34	6-32 nut
48	252-22	4	#6 speednut
49	253-60	6	#6 flat washer
50	254-1	55	#6 lockwasher
51	259-1	3	#6 solder lug

#8 Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
52	250-16	~~2~~	8-32 x 3/16″ setscrew
53	250-43	2	8-32 x 1/4″ setscrew
54	250-22	2	8-32 x 7/16″ setscrew
55	250-137	2	8-32 x 3/8″ screw
56	252-4	2	8-32 nut
57	253-9	2	#8 flat washer
58	254-2	2	#8 lockwasher

Control Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
59	252-7	5	Control nut
60	253-10	4	Control flat washer
61	254-5	5	Control lockwasher
62	259-10	1	Control solder lug

Antenna Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
63	252-39	1	Antenna nut
64	253-50	1	Nylon shoulder washer
65	253-49	1	Nylon flat washer
66	455-31	1	Antenna bushing
67	259-12	1	Antenna solder lug

Bushings-Collar

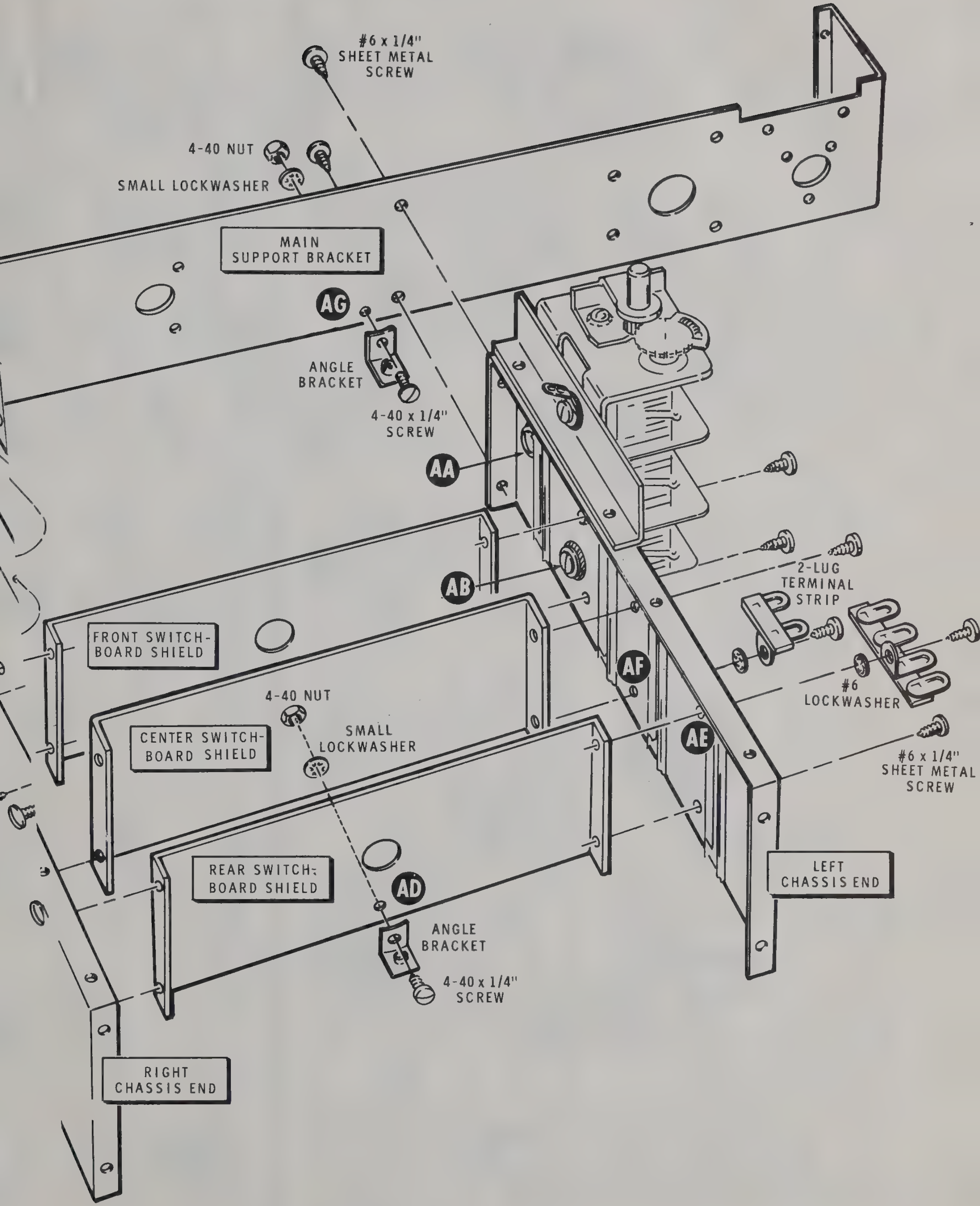
KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
68	455-13	1	1/4″ bandspread bushing
69	455-9	1	3/8″ tuning bushing
70	455-11	1	Split bushing
71	455-15	1	Bandswitch collar

Miscellaneous Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
72	100-302	2	Tuning pulley
73	204-9	3	Angle bracket
74	250-175	1	2-56 x 3/8″ screw
75	250-305	4	6-32 x 9/16″ stud
76	252-51	1	2-56 nut
77	253-11	~~2~~	E washer
78	253-39	~~1~~	1/4″ flat washer
79	255-2	3	7/32″ metal spacer
80	255-23	4	6-32 x 15/32″ tapped spacer
81	258-1	~~1~~	Spring
82	258-183	~~1~~	Spring clip
83	261-34	4	Foot
84	266-142	1	Switch detent
85	432-66	~~2~~	Speaker connector

SHEET METAL PARTS

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
86	90-1178-1	1	Cabinet top
87	90-1179-1	1	Cabinet bottom
88	210-41	1	Bezel
89	100-805	1	Front panel
90	100-734	1	Front subpanel
91	203-1178-1	1	Rear panel
92	204-889	1	Main support bracket
93	100-735	1	Right chassis end
94	100-736	1	Left chassis end
95	100-737	1	Bandspread dial drum
96	204-892	1	Bandspread bracket
97	204-890	1	Switch bracket
98	204-891	1	Capacitor bracket
99	204-923	1	Antenna bracket
100	206-409	3	Switch-Board shield
101	206-408	1	Speaker shield
102	206-410	1	Receiver shield
103	205-611	1	Bottom shield


#6 x 1/4" SHEET METAL SCREW
4-40 NUT
SMALL LOCKWASHER
MAIN SUPPORT BRACKET
AG
ANGLE BRACKET
4-40 x 1/4" SCREW
AA
AB
2-LUG TERMINAL STRIP
FRONT SWITCH-BOARD SHIELD
AF
#6 LOCKWASHER
4-40 NUT
SMALL LOCKWASHER
CENTER SWITCH-BOARD SHIELD
AE
#6 x 1/4" SHEET METAL SCREW
REAR SWITCH-BOARD SHIELD
LEFT CHASSIS END
AD
ANGLE BRACKET
4-40 x 1/4" SCREW
RIGHT CHASSIS END

PICTORIAL 6-1

CONNECTORS-TERMINAL STRIPS

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
26	432-102	~~8~~	5-pin Switch-Board connector
27	431-2	~~1~~	2-lug terminal strip
28	431-6	~~2~~	2-lug screw type terminal strip
29	431-16	~~1~~	2-lug terminal strip
30	431-40	~~2~~	4-lug terminal strip
31	431-62	~~3~~	3-lug miniature terminal strip

HARDWARE

#4 Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
32	250-156	1	4-40 x 1/8" setscrew
33	250-3	2	4-40 x 3/16" screw
34	250-52	17	4-40 x 1/4" screw
35	250-4	2	4-40 x 3/8" screw
36	252-2	7	4-40 nut
37	254-9	7	Small lockwasher

#6 Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
38	250-138	3	6-32 x 3/16" screw
39	250-116	4	6-32 x 1/4" black screw
40	250-56	30	6-32 x 1/4" screw
41	250-170	35	#6 x 1/4" sheet metal screw
42	250-432	6	6-32 x 5/16" screw
43	250-100	2	6-32 x 5/16" setscrew
44	250-89	11	6-32 x 3/8" screw
45	250-32	2	6-32 x 3/8" flat head screw
46	250-162	3	6-32 x 1/2" screw
47	252-3	34	6-32 nut
48	252-22	4	#6 speednut
49	253-60	6	#6 flat washer
50	254-1	55	#6 lockwasher
51	259-1	3	#6 solder lug

#8 Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
52	250-16	~~2~~	8-32 x 3/16" setscrew
53	250-43	2	8-32 x 1/4" setscrew
54	250-22	2	8-32 x 7/16" setscrew
55	250-137	2	8-32 x 3/8" screw
56	252-4	2	8-32 nut
57	253-9	2	#8 flat washer
58	254-2	2	#8 lockwasher

Control Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
59	252-7	5	Control nut
60	253-10	4	Control flat washer
61	254-5	5	Control lockwasher
62	259-10	1	Control solder lug

Antenna Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
63	252-39	1	Antenna nut
64	253-50	1	Nylon shoulder washer
65	253-49	1	Nylon flat washer
66	455-31	1	Antenna bushing
67	259-12	1	Antenna solder lug

Bushings-Collar

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
68	455-13	1	1/4" bandspread bushing
69	455-9	1	3/8" tuning bushing
70	455-11	1	Split bushing
71	455-15	1	Bandswitch collar

Miscellaneous Hardware

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
72	100-302	2	Tuning pulley
73	204-9	3	Angle bracket
74	250-175	1	2-56 x 3/8" screw
75	250-305	4	6-32 x 9/16" stud
76	252-51	1	2-56 nut
77	253-11	~~2~~	E washer
78	253-39	~~1~~	1/4" flat washer
79	255-2	3	7/32" metal spacer
80	255-23	4	6-32 x 15/32" tapped spacer
81	258-1	~~1~~	Spring
82	258-183	~~1~~	Spring clip
83	261-34	4	Foot
84	266-142	1	Switch detent
85	432-66	~~2~~	Speaker connector

SHEET METAL PARTS

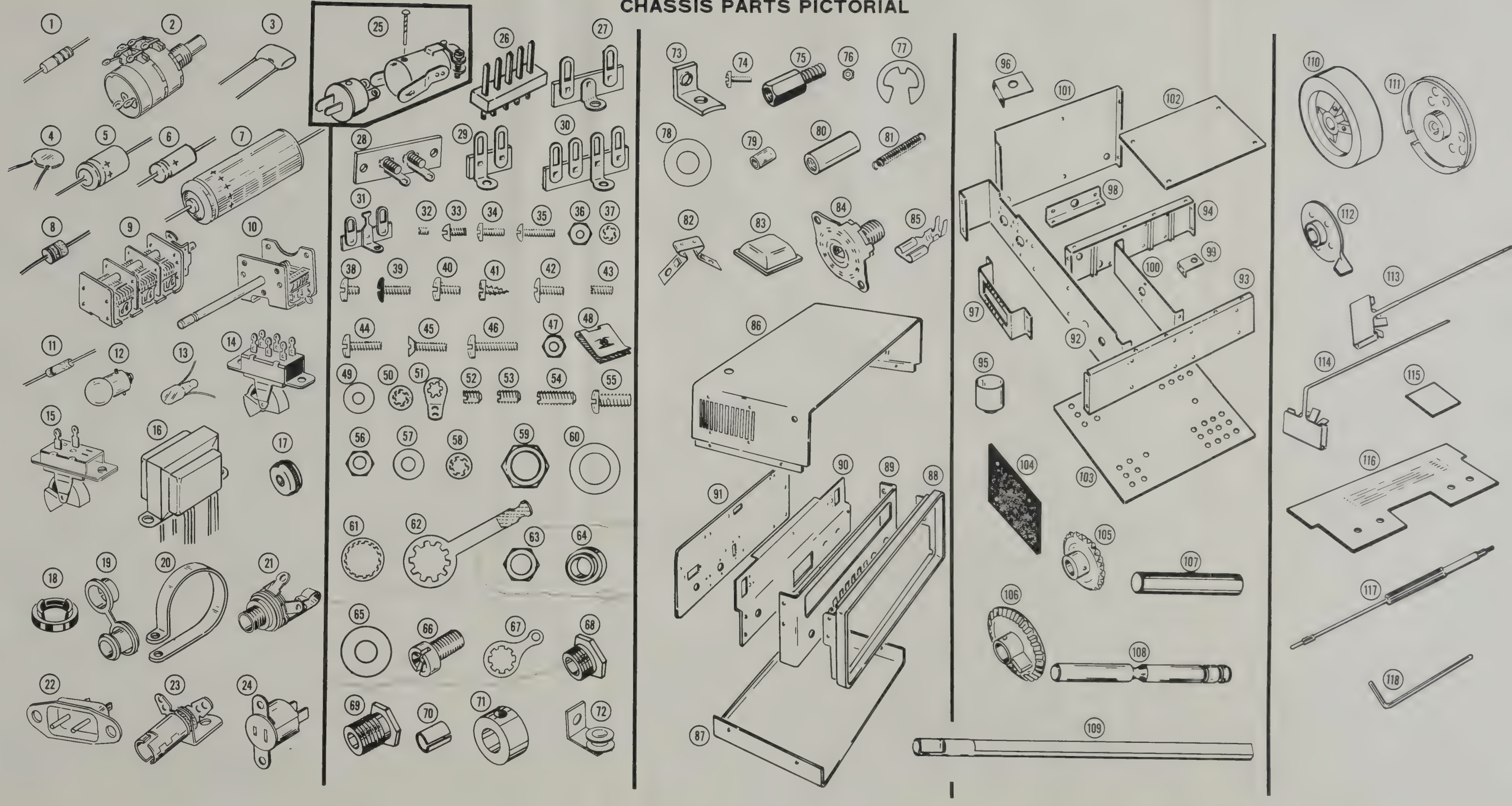
KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
86	90-1178-1	1	Cabinet top
87	90-1179-1	1	Cabinet bottom
88	210-41	1	Bezel
89	100-805	1	Front panel
90	100-734	1	Front subpanel
91	203-1178-1	1	Rear panel
92	204-889	1	Main support bracket
93	100-735	1	Right chassis end
94	100-736	1	Left chassis end
95	100-737	1	Bandspread dial drum
96	204-892	1	Bandspread bracket
97	204-890	1	Switch bracket
98	204-891	1	Capacitor bracket
99	204-923	1	Antenna bracket
100	206-409	3	Switch-Board shield
101	206-408	1	Speaker shield
102	206-410	1	Receiver shield
103	205-611	1	Bottom shield

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
MISCELLANEOUS MECHANICAL PARTS			
104	209-55	1	Speaker grille
	211-35	1	Handle
	349-3	1	Dial cord
05	451-61	1	36 tooth nylon gear
06	451-62	1	48 tooth nylon gear
07	453-2	1	Bandspread shaft
08	453-172	1	Tuning shaft
09	453-198	1	Bandswitch shaft
10	454-12	1	Flywheel
11	100-452	1	Capacitor pulley
	462-140	2	Large knob
	462-159	2	Small knob
12	462-240	1	Lever knob
13	463-32	1	Bandspread dial pointer
14	463-49	1	Main dial pointer
MISCELLANEOUS ELECTRICAL PARTS			
	85-280	1	Large circuit board
	89-3	1	Line cord
	134-187	1	Wire harness
	142-42	1	Antenna
	344-15	1	Black stranded wire
	344-16	1	Red stranded wire
	345-1	1	Braid
	401-135	1	Speaker

KEY No.	PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous Electrical Parts (cont'd.)			
	407-135	1	Meter
	418-23	1	Battery (NOTE: Do not remove the tape from the battery leads until instructed to do so.)
GENERAL			
115	75-93	2	Fiber spacer
	390-252	1	Bandspread label - amateur bands
	390-253	1	Bandspread label - short-wave bands
	390-1112	1	Warning label
	391-34	1	Blue and white label
116	464-53	1	Plastic dial window
117	490-1	1	Alignment tool
118	490-23	1	Allen wrench
	500-7	1	Heathkit logs and chart book
	597-260	1	Parts order form

NOTE: The prices shown on the separate "Heath Parts Price List" apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

CHASSIS PARTS PICTORIAL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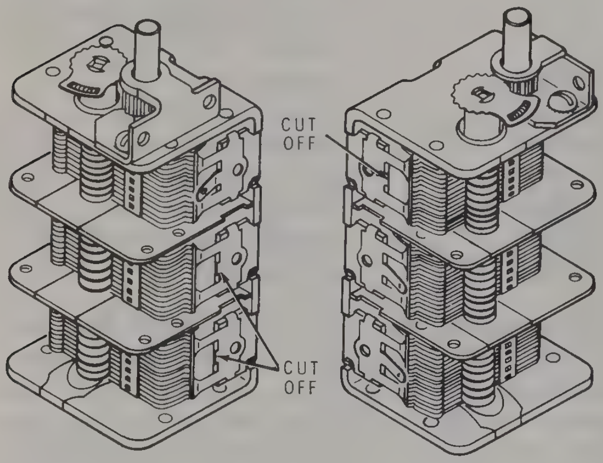
STEP-BY-STEP ASSEMBLY

CHASSIS SUBASSEMBLY

Refer to Pictorial 6-1 for the following steps.

NOTE: Keep the plates of the variable capacitor fully meshed (closed) at all times to prevent their being damaged.

( ) Refer to Detail 6-1A for the following steps. Cut off the three indicated lugs of the variable tuning capacitor (#26-143) as shown.


CUT OFF
CUT OFF

Detail 6-1A

Refer to Detail 6-1B for the following steps.

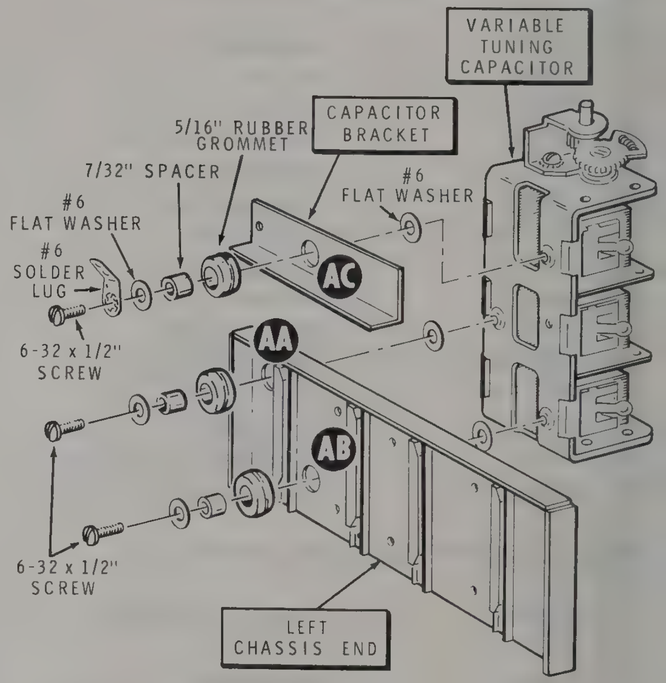
(✓) Install 5/16" rubber grommets into holes AA and AB of the left chassis end.

(✓) Push a 7/32" metal spacer into each rubber grommet just installed.

( ) Mount the variable tuning capacitor to the left chassis end. Use a 6-32 x 1/2" screw and two #6 flat washers at hole AA, and a 6-32 x 1/2" screw and two #6 flat washers at hole AB. Be sure to position the hardware and the variable tuning capacitor as shown.

(✓) Install a 5/16" rubber grommet into hole AC in the capacitor bracket as shown.

(✓) Push a 7/32" metal spacer into the rubber grommet just installed.


VARIABLE TUNING CAPACITOR
CAPACITOR BRACKET
5/16" RUBBER GROMMET
7/32" SPACER
#6 FLAT WASHER
#6 FLAT WASHER
#6 SOLDER LUG
6-32 x 1/2" SCREW
AC
AA
AB
6-32 x 1/2" SCREW
LEFT CHASSIS END

Detail 6-1B

(✓) Mount the capacitor bracket to the variable tuning capacitor with a 6-32 x 1/2" screw, a #6 solder lug, and two #6 flat washers at hole AC. Be sure to position the capacitor bracket and #6 solder lug as shown.

Refer to Pictorial 6-1 for the following steps.

NOTE: When hardware is called for in a step, only the screw size will be given. For instance, if 4-40 x 1/4" hardware is called for, it means that a 4-40 x 1/4" screw, one or more small lockwashers, and a 4-40 nut should be used. The Pictorial or a Detail associated with the step will show the proper number and location of lockwashers.

(✓) Mount an angle bracket at AD on the rear Switch-Board shield with 4-40 x 1/4" hardware. Be sure to position the angle bracket as shown.

( ) Mount the rear Switch-Board shield to the left chassis end with two #6 x 1/4" sheet metal screws and a 4-lug terminal strip at AE. Be sure to position the terminal strip as shown.

( ) Mount the center Switch-Board shield to the left chassis end with #6 x 1/4" sheet metal screws and a 2-lug terminal strip at AF. Be sure to position the terminal strip as shown.

( ) Mount the front Switch-Board shield to the left chassis end with two #6 x 1/4" sheet metal screws.

( ) Mount the right chassis end to the front, center, and rear Switch-Board shields with two #6 x 1/4" sheet metal screws in each shield.

( ) Locate the main support bracket and position it as shown in the Pictorial.

( ) Mount an angle bracket at AG on the main support bracket with a 4-40 x 1/4" screw, a small lockwasher, and a 4-40 nut. Be sure to position the angle bracket as shown.

( ) Mount the remaining angle bracket at AH on the main support bracket in the same manner.

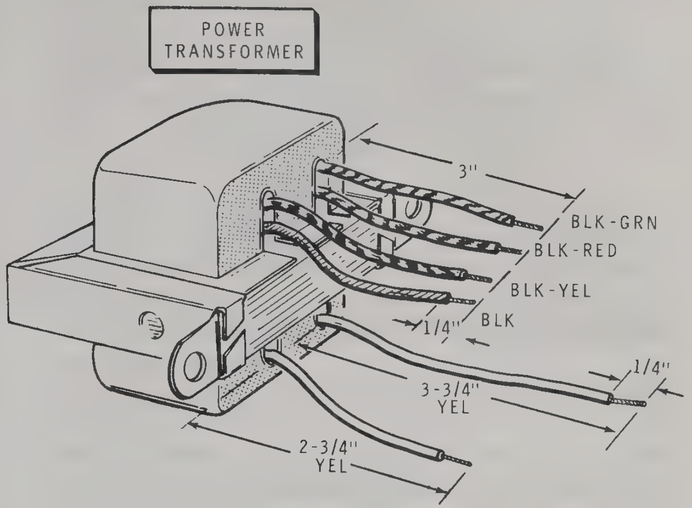
( ) Mount the main support bracket to the previously prepared chassis subassembly with four #6 x 1/4" sheet metal screws.

Refer to Pictorial 6-2 (fold-out from Page 40) for the following steps.

( ) Locate the large circuit board (#85-280) and position it foil side up.

( ) Mount four 6-32 x 15/32" tapped spacers with 6-32 x 1/4" screws and #6 lockwashers on the large circuit board as shown. Be sure to mount the spacers in the correct holes.

NOTE: The large circuit board will be mounted to the chassis subassembly in the following steps. Do not tighten any of the mounting hardware until a screw, lockwasher, and nut is located at each of the eight mounting holes.



Detail 6-2A

( ) Position the large circuit board on the chassis subassembly by sliding the edge of the circuit board between the left chassis end and the capacitor bracket as shown in the Pictorial. Then line up the eight mounting holes with the corresponding holes in the chassis subassembly.

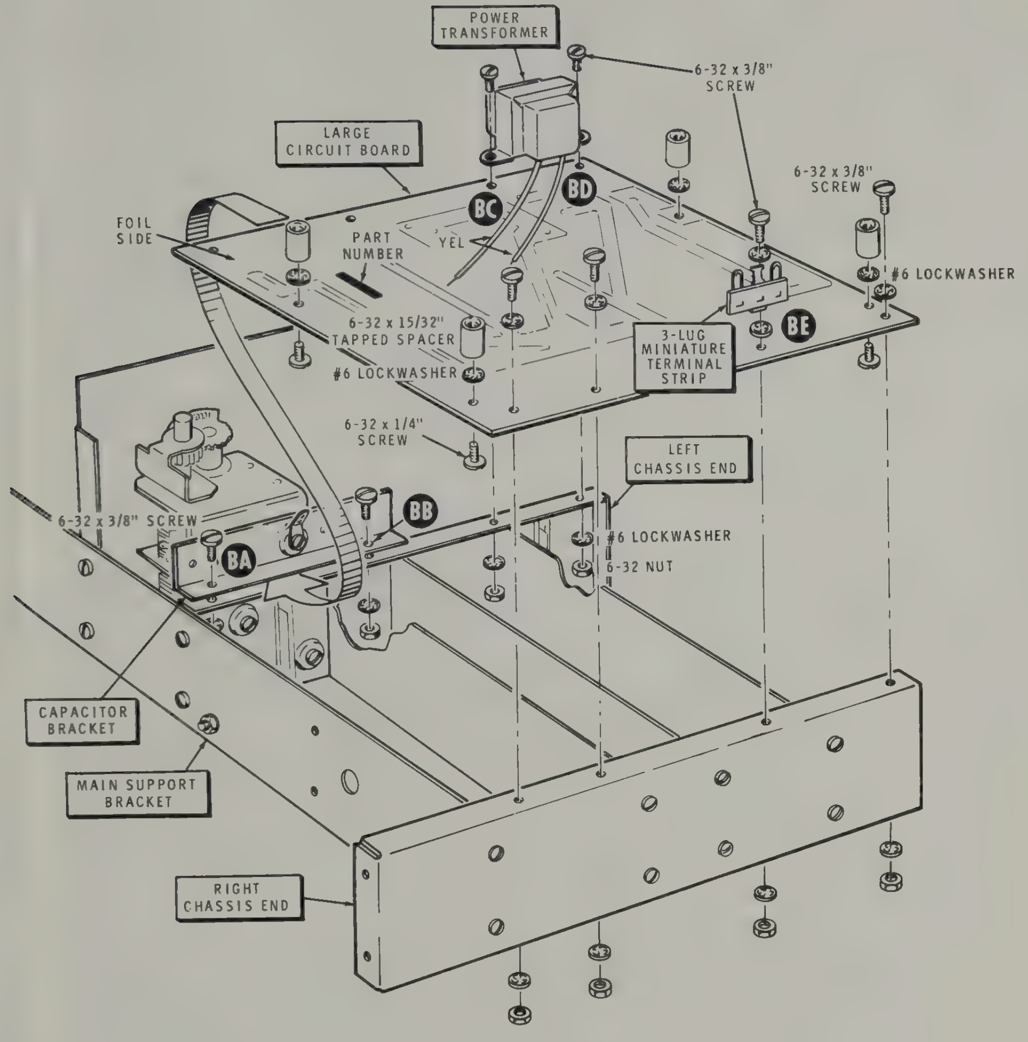
( ) Mount the large circuit board to the capacitor bracket with 6-32 x 3/8" hardware at holes BA and BB.

( ) Locate the power transformer (#54-226) and prepare its leads as shown in Detail 6-2A.

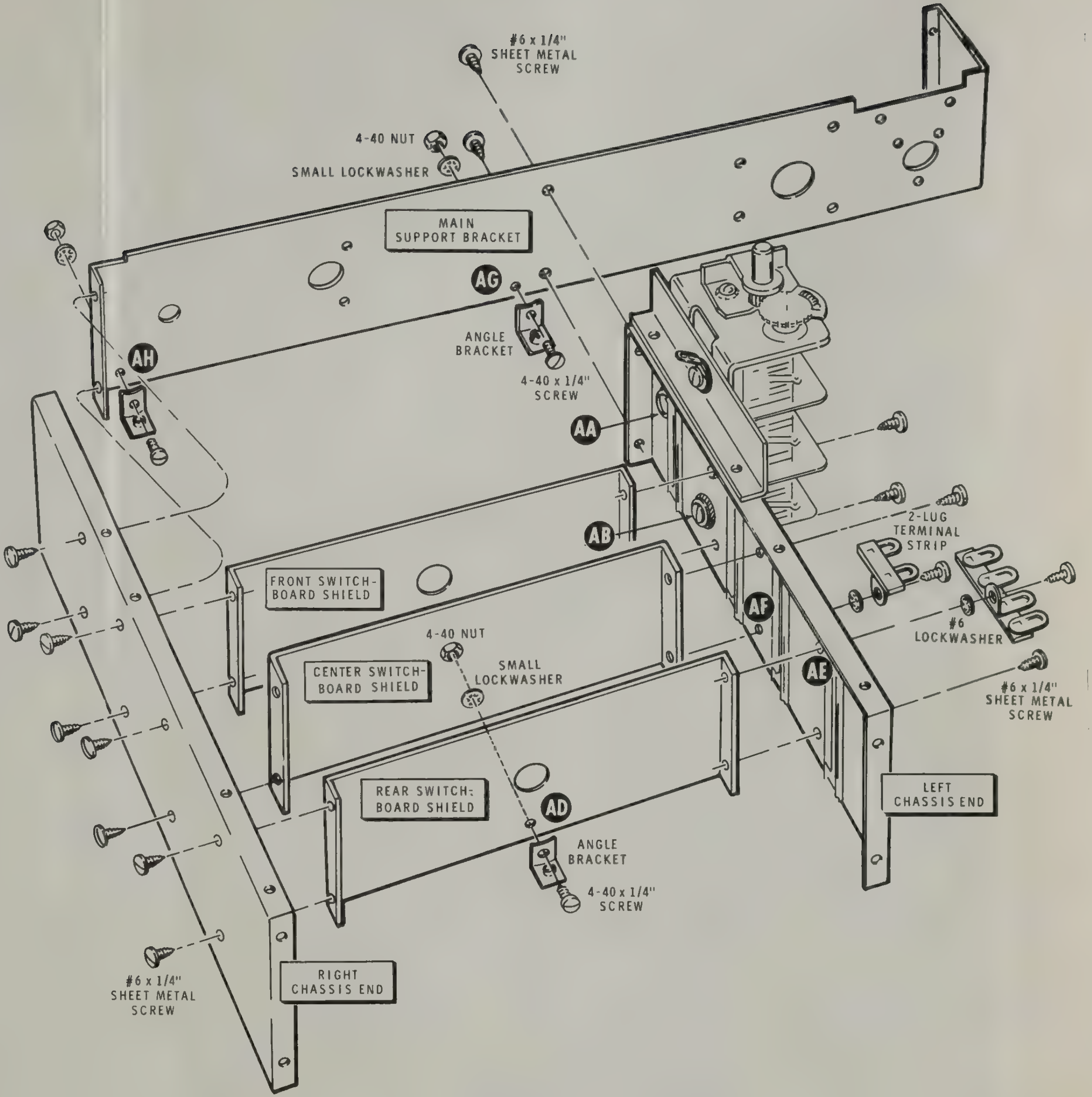
( ) Mount the power transformer to the large circuit board and chassis subassembly at holes BC and BD with 6-32 x 3/8" hardware. Position the yellow leads as shown.

( ) Install a 3-lug miniature terminal strip at BE with 6-32 x 3/8" hardware.

( ) Finish mounting the large circuit board to the chassis subassembly with 6-32 x 3/8" hardware in the remaining three mounting holes. Now tighten the mounting hardware in all eight mounting holes.


POWER TRANSFORMER
6-32 x 3/8" SCREW
LARGE CIRCUIT BOARD
6-32 x 3/8" SCREW
FOIL SIDE
BC
BD
PART NUMBER
YEL
#6 LOCKWASHER
6-32 x 15/32" TAPPED SPACER
3-LUG MINIATURE TERMINAL STRIP
BE
#6 LOCKWASHER
6-32 x 1/4" SCREW
LEFT CHASSIS END
6-32 x 3/8" SCREW
BB
BA
#6 LOCKWASHER
6-32 NUT
CAPACITOR BRACKET
MAIN SUPPORT BRACKET
RIGHT CHASSIS END

PICTORIAL 6-2


#6 x 1/4" SHEET METAL SCREW
4-40 NUT
SMALL LOCKWASHER
MAIN SUPPORT BRACKET
AG
ANGLE BRACKET
4-40 x 1/4" SCREW
AH
AA
AB
2-LUG TERMINAL STRIP
FRONT SWITCH-BOARD SHIELD
CENTER SWITCH-BOARD SHIELD
4-40 NUT
SMALL LOCKWASHER
AF
#6 LOCKWASHER
AE
#6 x 1/4" SHEET METAL SCREW
REAR SWITCH-BOARD SHIELD
AD
ANGLE BRACKET
4-40 x 1/4" SCREW
LEFT CHASSIS END
RIGHT CHASSIS END
#6 x 1/4" SHEET METAL SCREW

PICTORIAL 6-1

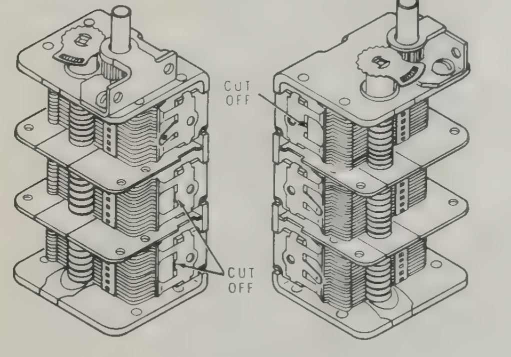
STEP-BY-STEP ASSEMBLY

CHASSIS SUBASSEMBLY

Refer to Pictorial 6-1 for the following steps.

NOTE: Keep the plates of the variable capacitor fully meshed (closed) at all times to prevent their being damaged.

( ) Refer to Detail 6-1A for the following steps. Cut off the three indicated lugs of the variable tuning capacitor (#26-143) as shown.


CUT OFF
CUT OFF

Detail 6-1A

Refer to Detail 6-1B for the following steps.

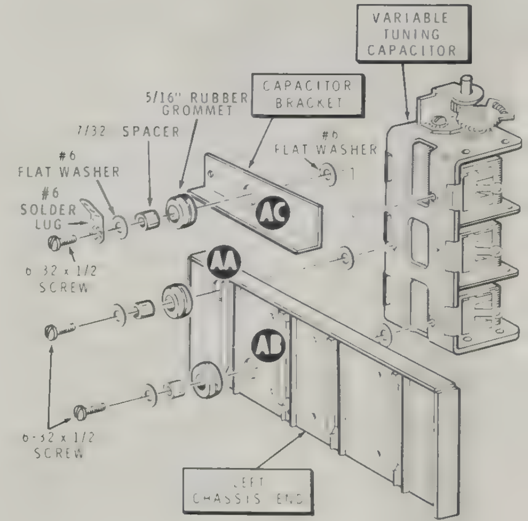
( ) Install 5/16" rubber grommets into holes AA and AB of the left chassis end.

( ) Push a 7/32" metal spacer into each rubber grommet just installed.

( ) Mount the variable tuning capacitor to the left chassis end. Use a 6-32 x 1/2" screw and two #6 flat washers at hole AA, and a 6-32 x 1/2" screw and two #6 flat washers at hole AB. Be sure to position the hardware and the variable tuning capacitor as shown.

( ) Install a 5/16" rubber grommet into hole AC in the capacitor bracket as shown.

( ) Push a 7/32" metal spacer into the rubber grommet just installed.


VARIABLE TUNING CAPACITOR
CAPACITOR BRACKET
5/16" RUBBER GROMMET
7/32 SPACER
#6 FLAT WASHER
#6 FLAT WASHER
#6 SOLDER LUG
6-32 x 1/2 SCREW
AC
AA
AB
6-32 x 1/2 SCREW
LEFT CHASSIS END

Detail 6-1B

( ) Mount the capacitor bracket to the variable tuning capacitor with a 6-32 x 1/2" screw, a #6 solder lug, and two #6 flat washers at hole AC. Be sure to position the capacitor bracket and #6 solder lug as shown.

Refer to Pictorial 6-1 for the following steps.

NOTE: When hardware is called for in a step, only the screw size will be given. For instance, if 4-40 x 1/4" hardware is called for, it means that a 4-40 x 1/4" screw, one or more small lockwashers, and a 4-40 nut should be used. The Pictorial or a Detail associated with the step will show the proper number and location of lockwashers.

( ) Mount an angle bracket at AD on the rear Switch-Board shield with 4-40 x 1/4" hardware. Be sure to position the angle bracket as shown.

( ) Mount the rear Switch-Board shield to the left chassis end with two #6 x 1/4" sheet metal screws and a 4-lug terminal strip at AE. Be sure to position the terminal strip as shown.

( ) Mount the center Switch-Board shield to the left chassis end with #6 x 1/4" sheet metal screws and a 2-lug terminal strip at AF. Be sure to position the terminal strip as shown.

( ) Mount the front Switch-Board shield to the left chassis end with two #6 x 1/4" sheet metal screws.

( ) Mount the right chassis end to the front, center, and rear Switch-Board shields with two #6 x 1/4" sheet metal screws in each shield.

( ) Locate the main support bracket and position it as shown in the Pictorial.

( ) Mount an angle bracket at AG on the main support bracket with a 4-40 x 1/4" screw, a small lockwasher, and a 4-40 nut. Be sure to position the angle bracket as shown.

( ) Mount the remaining angle bracket at AH on the main support bracket in the same manner.

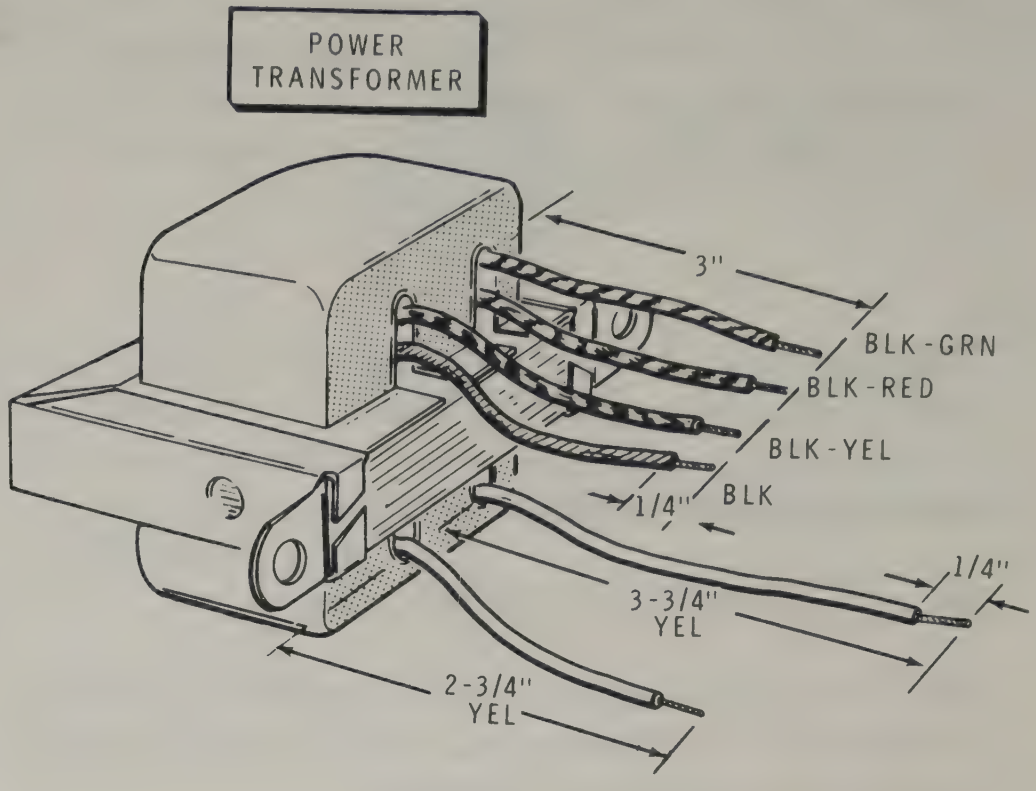
( ) Mount the main support bracket to the previously prepared chassis subassembly with four #6 x 1/4" sheet metal screws.

Refer to Pictorial 6-2 (fold-out from Page 40) for the following steps.

( ) Locate the large circuit board (#85-280) and position it foil side up.

( ) Mount four 6-32 x 15/32" tapped spacers with 6-32 x 1/4" screws and #6 lockwashers on the large circuit board as shown. Be sure to mount the spacers in the correct holes.

NOTE: The large circuit board will be mounted to the chassis subassembly in the following steps. Do not tighten any of the mounting hardware until a screw, lockwasher, and nut is located at each of the eight mounting holes.



Detail 6-2A

( ) Position the large circuit board on the chassis subassembly by sliding the edge of the circuit board between the left chassis end and the capacitor bracket as shown in the Pictorial. Then line up the eight mounting holes with the corresponding holes in the chassis subassembly.

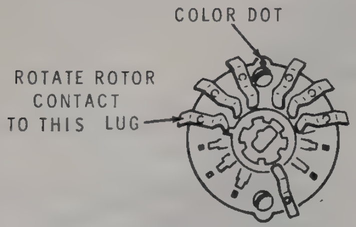
( ) Mount the large circuit board to the capacitor bracket with 6-32 x 3/8" hardware at holes BA and BB.

( ) Locate the power transformer (#54-226) and prepare its leads as shown in Detail 6-2A.

( ) Mount the power transformer to the large circuit board and chassis subassembly at holes BC and BD with 6-32 x 3/8" hardware. Position the yellow leads as shown.

( ) Install a 3-lug miniature terminal strip at BE with 6-32 x 3/8" hardware.

( ) Finish mounting the large circuit board to the chassis subassembly with 6-32 x 3/8" hardware in the remaining three mounting holes. Now tighten the mounting hardware in all eight mounting holes.



Detail 6-3A

SWITCH-BOARD INSTALLATION

Refer to Detail 6-3A for the following steps.

NOTE: The switch wafers on each Switch-Board will be positioned in the following steps. Do not move any of the rotors once they have been positioned.

( ) Locate the bandswitch shaft and the oscillator Switch-Board (#85-279-13).

( ) Refer to the Detail and insert the bandswitch shaft through each of the three switch wafers on the Switch-Board. Then rotate the shaft so the rotor contact of each switch wafer is positioned exactly as shown. Remove the shaft without moving the rotor and carefully set this Switch-Board aside until it is called for.

( ) Locate the mixer Switch-Board (#85-279-12). Use the bandswitch shaft to position the rotor contact of the switch wafer exactly as before. Then remove the shaft without moving the rotor. Set the Switch-Board aside until it is called for.

( ) Locate the RF Switch-Board (#85-279-2). Use the bandswitch shaft to position the rotor contact of each switch wafer exactly as before. Then remove the shaft without moving any rotors. Set the Switch-Board aside until it is called for.

( ) Locate the antenna Switch-Board (#85-279-1). Use the bandswitch shaft to position the rotor contact of each switch wafer exactly as before. Then remove the shaft without moving any rotors. Set the Switch-Board aside until it is called for.

Refer to Pictorial 6-3 (fold-out from Page 47) for the following steps.

( ) Position the chassis subassembly as shown in the Pictorial.

NOTE: Refer to the inset drawing on the Pictorial when instructed to remove a numbered pin from one of the 5-pin Switch-Board plugs.

( ) Remove pin number 2, pin number 3, and pin number 4 from a Switch-Board plug. Then position the plug into the two holes at CA in the large circuit board.

( ) Remove pin number 1, pin number 2, and pin number 4 from Switch-Board plug CB. Then position the plug into the two holes at CB in the large circuit board.

( ) Locate the oscillator Switch-Board (#85-279-13).

( ) Insert the Switch-Board into its correct mounting guides and make sure the connectors are aligned with the pins on each plug. Then push the Switch-Board down so the pins go into their respective connectors.

( ) Remove pin number 2 and pin number 4 from Switch-Board plug CC. Then position the plug into the three holes at CC in the large circuit board.

( ) Remove pin number 1, pin number 2, and pin number 4 from Switch-Board plug CD. Then position the plug into the two holes at CD in the large circuit board.

( ) Locate the mixer Switch-Board (#85-279-12).

( ) Insert the Switch-Board into its correct mounting guides and make sure the connectors are aligned with the pins on each plug. Then push the Switch-Board down so the pins go into their respective connectors.

NOTE: If the coil pins of the mixer Switch-Board (just installed) touch the Switch-Board shield, bend the shield away from the coil pins.

( ) Remove pin number 2 and pin number 4 from plug CE. Then position the plug into the three holes of CE in the large circuit board.

( ) Remove pin number 2 and pin number 4 from Switch-Board plug CF. Then position the plug into the three holes at CF in the large circuit board.

( ) Locate the RF Switch-Board (#85-279-2).

( ) Insert the Switch-Board into its correct mounting guides and make sure the connectors are aligned with the pins on each plug. Then push the Switch-Board down so the pins go into their respective connectors.

( ) Remove pin number 2, pin number 3, and pin number 4 from Switch-Board plug CG. Then position the plug into the two outside holes at CG in the large circuit board.

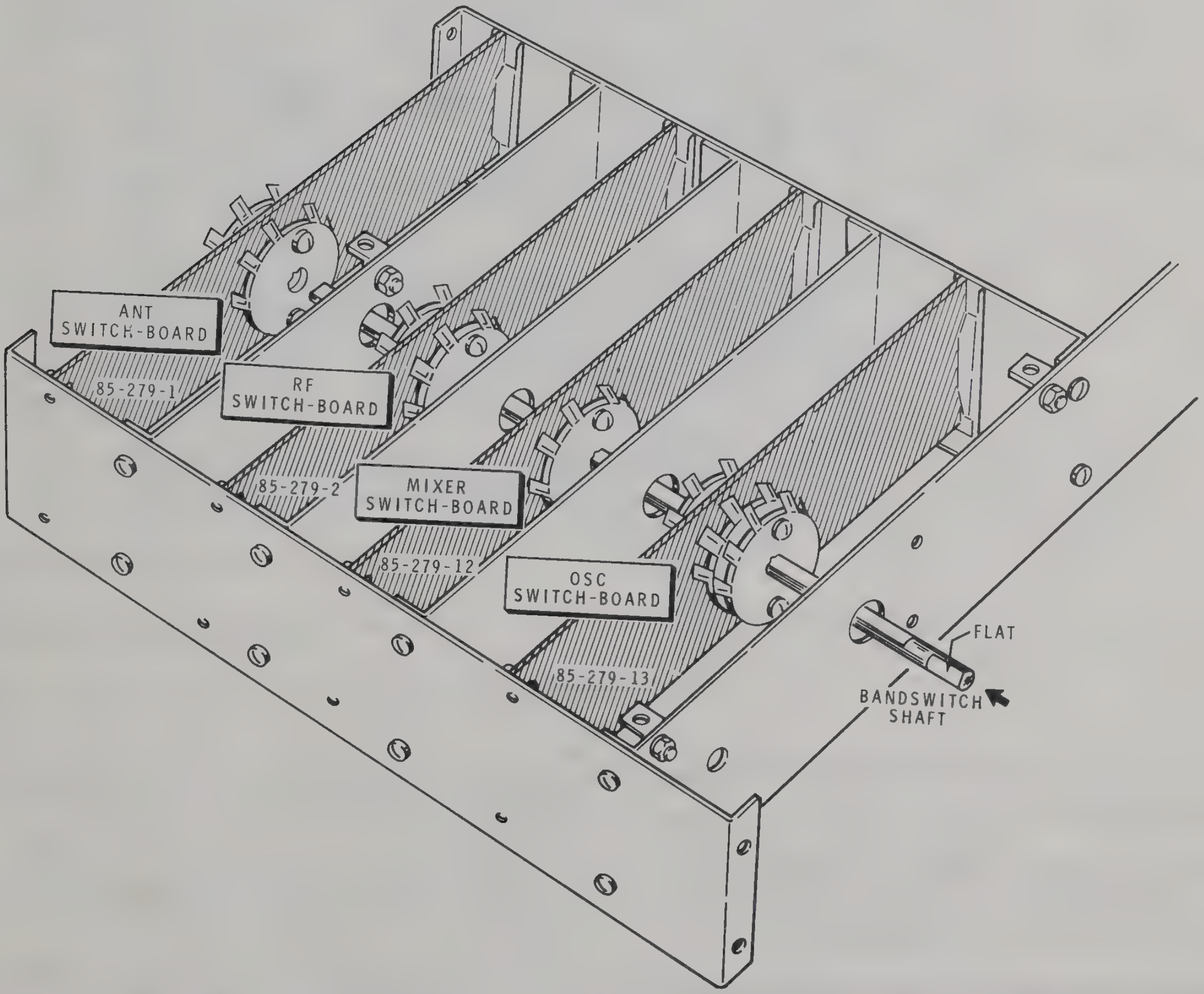
( ) Remove pin number 1, pin number 2, and pin number 4 from Switch-Board plug CH. Then position the plug into the two holes at CH in the large circuit board.

( ) Locate the antenna Switch-Board (#85-279-1).

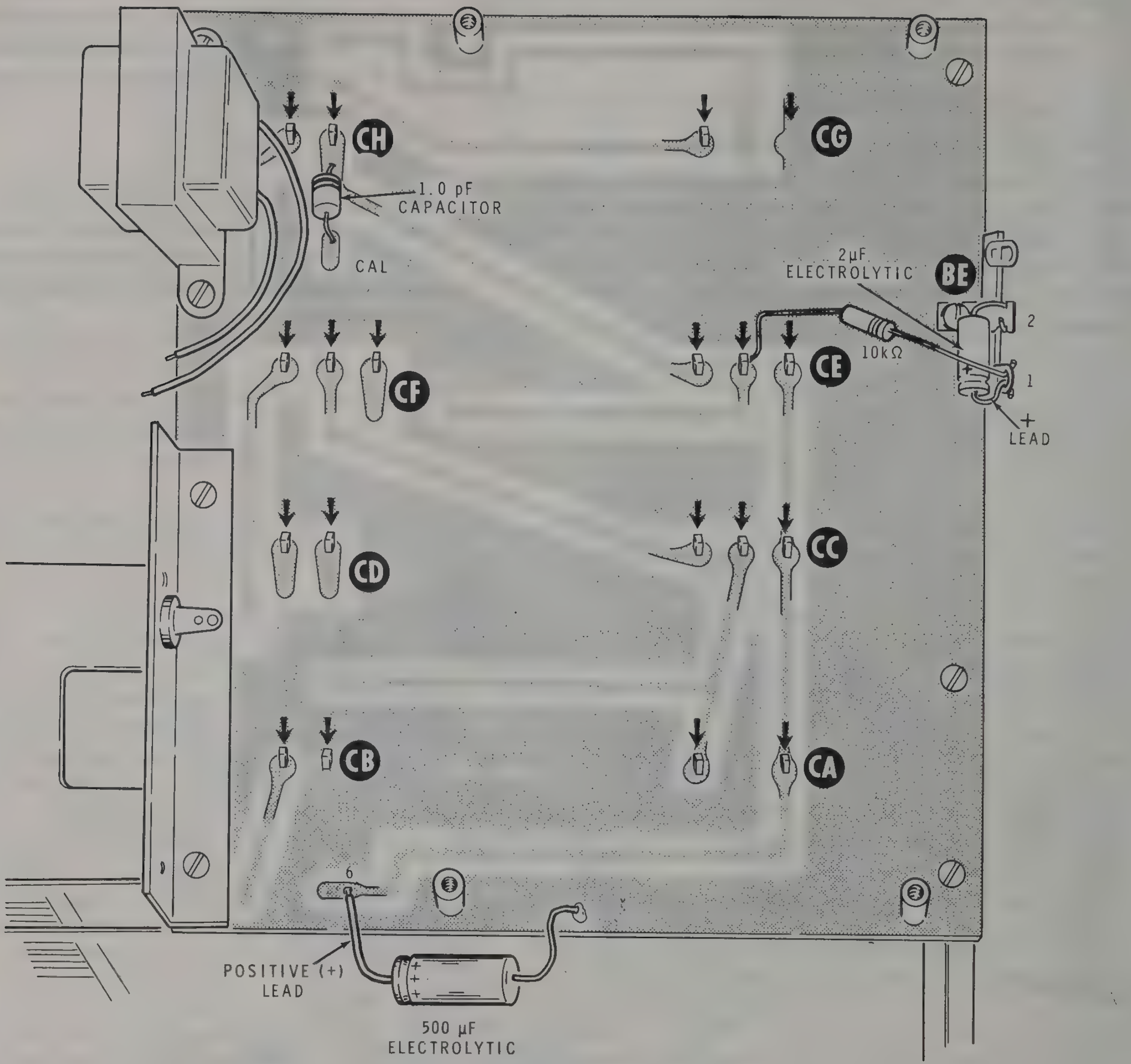
NOTE: When installing the Switch-Board in the next steps, it will be necessary to bow the Switch-Board slightly so the switch wafer will clear the angle bracket mounted on the Switch-Board shield. Bow the board carefully so it will not crack. Also check the clearance between the coil pins and the shield. Bend the shield away from the coil pins if necessary.

( ) Insert the Switch-Board into its correct mounting guides and make sure the connectors are aligned with the pins on each plug. Then push the Switch-Board down so the pins go into their respective connectors.

( ) Refer to Detail 6-3B and insert the bandswitch shaft through each switch wafer of the four Switch-Boards. Be very careful not to damage any of the switches. It may be necessary to wiggle or slightly rotate the bandswitch shaft.


ANT SWITCH-BOARD
85-279-1
RF SWITCH-BOARD
85-279-2
MIXER SWITCH-BOARD
85-279-12
OSC SWITCH-BOARD
85-279-13
FLAT
BANDSWITCH SHAFT

Detail 6-3B


CH
1.0 pF CAPACITOR
CAL
CG
2μF ELECTROLYTIC
BE
2
10kΩ
1
+ LEAD
CF
CE
CD
CC
CB
CA
6
POSITIVE (+) LEAD
500 μF ELECTROLYTIC

Detail 6-3C

( ) Check to see that all four Switch-Boards are pushed all-the-way in.

( ) Position the chassis subassembly as shown in Detail 6-3C. The Switch-Board plugs will be soldered to the large circuit board in the following steps.

( ) Solder the plug pins at CA and CB on the large circuit board.

( ) Solder the plug pins at CC and CD on the large circuit board.

( ) Solder the plug pins at CE and CF on the large circuit board.

( ) Solder the plug pins at CG and CH on the large circuit board.

( ) Refer to Detail 6-3C and connect the positive (+) lead of a 2 μF electrolytic capacitor to lug 1 (NS) and the other lead to lug 2 (S-1) of 3-lug minature strip BE. Position the capacitor as shown.

( ) Connect a 10 kΩ (brown-black-orange) resistor from lug 1 of terminal strip BE (S-2) to the foil at the center pin of plug CE (S-1). Position the resistor 1/4" above the circuit board.

( ) Carefully remove the bandswitch shaft from the four switchboards.

( ) Locate a 1.0 pF phenolic capacitor (brown-black-white-silver) and cut each lead to 1/4".

( ) Connect one lead of this capacitor to the indicated hole marked CAL in the large circuit board (S-1) as shown in Detail 6-3C.

( ) Connect the other lead to the hole in the foil near the plug pin at CH (S-1) of the large circuit board as shown in Detail 6-3C.

( ) Locate the 500 μF tubular electrolytic capacitor and cut each lead to 3/4".

( ) Locate the red stranded wire and remove a 1/2" length of insulation.

( ) Place the 1/2" length of insulation over the positive (+) lead of the 500 μF tubular electrolytic capacitor.

( ) Connect the positive (+) lead of the capacitor to the hole indicated at 6 in the large circuit board (S-1).

( ) Solder the opposite lead of the capacitor to the foil of the large circuit board (S-1) as shown in the Detail.

( ) Set the chassis subassembly aside temporarily.

WIRE HARNESS INSTALLATION

Refer to Pictorial 6-4 (fold-out from Page 47) for the following steps.

( ) Locate the wire harness and the receiver circuit board and position the wires and cables from the breakouts (BO #1, BO #2, etc.) as shown in the Pictorial. The wire harness will be connected to the receiver circuit board in the following steps.

Locate the black shielded cable coming from BO #1. This cable has a red lead, black lead, and a bare lead. Connect the wires of this cable to circuit board holes as directed in the next three steps.

( ) Black lead to hole 9 (S-1).

( ) Red lead to the free lead of the 1000 Ω resistor extending from hole 10 (S-1).

NOTE: There are several holes marked S on the receiver circuit board. Be sure to use the correct hole, as directed in the steps, when hole S is called out.

( ) Bare lead to hole S near hole 7 (S-1).

Locate the gray shielded cable coming from BO #1. This cable has a red lead, black lead, and a white lead. Connect these cable wires as follows:

( ) Black lead to hole 18 (S-1).

( ) Red lead to hole 13 (S-1).

( ) White lead to hole 6 (S-1).

( ) Connect either white wire coming from BO #1 to hole 7 (S-1).

( ) Connect the other white wire coming from BO #1 to hole 8 (S-1).

( ) Connect the orange wire coming from BO #1 to hole 14 (S-1).

( ) Connect the violet wire coming from BO #2 to hole 15 (S-1).

( ) Connect the black wire coming from BO #2 to hole 17 (S-1).

( ) Locate the black shielded cable coming from BO #3, that is marked with red. Then cut off the outer bare wire.

( ) Connect the inner lead to hole 19 (S-1).

Locate the other two black shielded cables coming from BO #3. Connect these cables as follows:

( ) Connect the inner lead from one cable to hole 5 (S-1).

( ) Connect the inner lead from the other cable to hole 23 (S-1).

( ) Twist together the outer bare leads from both cables and connect to hole S (near hole 23) (S-2).

Connect the wires coming out of BO #4 as follows:

( ) Green wire to hole 21 (S-1).

( ) Blue wire to hole 20 (S-1).

( ) Violet wire to hole 3 (S-1).

( ) Gray wire to hole 4 (S-1).

( ) Red wire to hole 2 (S-1).

Locate the black shielded cable coming out of BO #5 that is marked with green. Connect this cable as follows:

( ) Inner lead to hole 1 (S-1).

( ) Outer bare lead to hole S, alongside of hole 1 (S-1).

The wire harness will be connected to the large circuit board in the following steps.

( ) Position the receiver circuit board and the wire harness over the large circuit board as shown in Pictorial 6-4.

Locate the black shielded cable coming from BO #1 that is marked with red. Connect this cable to the large circuit board as directed in the next two steps.

( ) Inner lead to the hole marked CAL (S-1).

NOTE: At some locations, there will be no hole in the circuit board. In these cases, as in the next step, solder the lead or wire directly to the foil.

( ) Outer bare lead soldered to the foil as shown in the Pictorial (S-1).

Connect the wire coming out of BO #2 to the large circuit board as follows:

( ) Green wire to hole AGC (S-1).

( ) Yellow wire to hole 1 (S-1).

Locate the black shielded cable coming from BO #3 that is marked with green. Connect this cable to the large circuit board as directed in the next two steps.

( ) Inner lead to hole 4 (S-1).

( ) Outer bare lead soldered to the foil as shown in the Pictorial (S-1).

Connect the blue wire coming from BO #3 to hole 3 (S-1).

( ) Prepare a 1-3/4" length and a 5-1/4" length of white hookup wire.

( ) Connect one end of the 1-3/4" hookup wire to hole 11 in the receiver circuit board (S-1). The other end will be connected later.

( ) Connect one end of the 5-1/4" hookup wire to hole 12 in the receiver circuit board (S-1). The other end will be connected later.

RECEIVER CIRCUIT BOARD INSTALLATION

Refer to Pictorial 6-5 for the following steps.

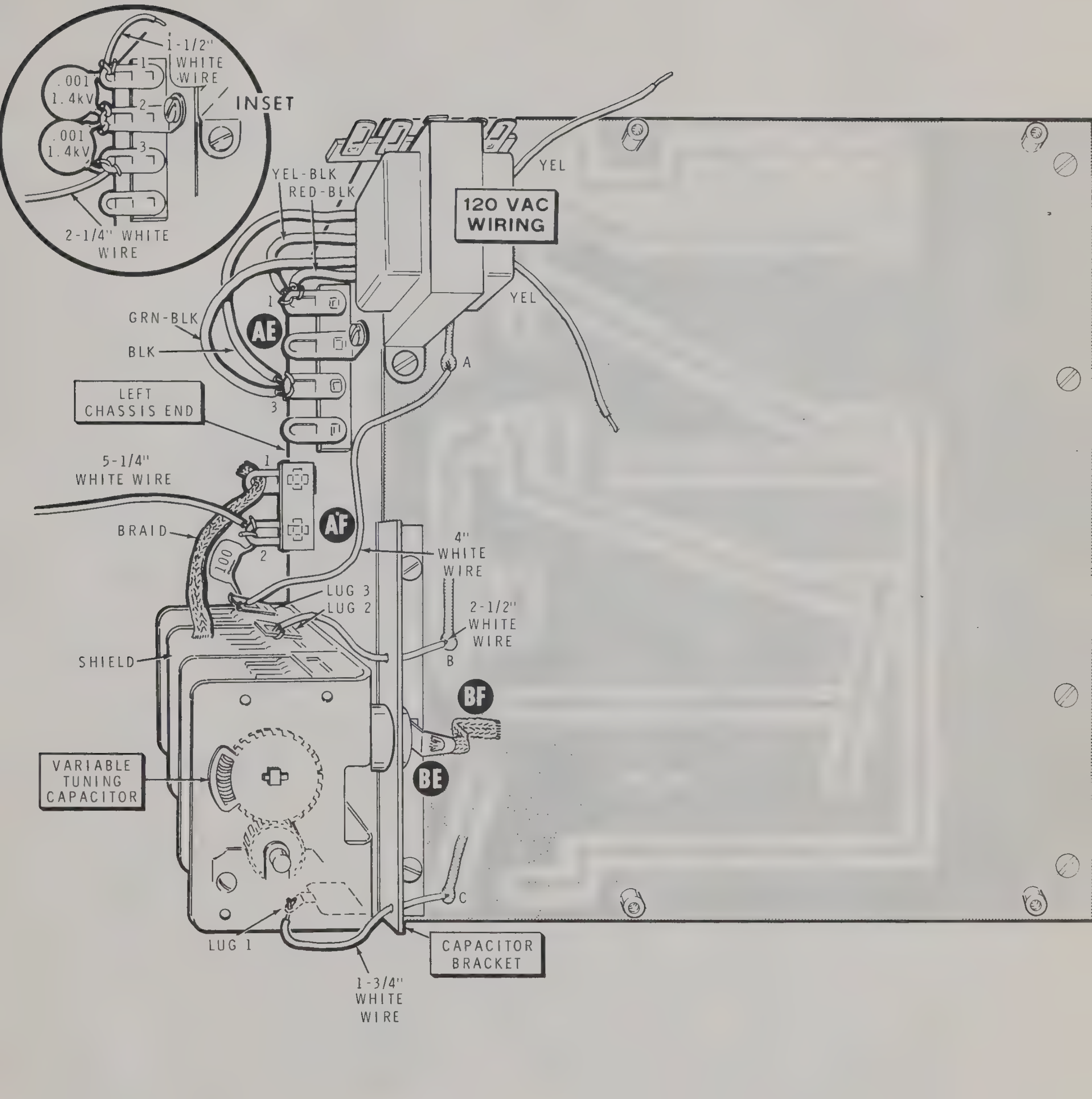
( ) Mount the receiver circuit board shield to the four 6-32 x 15/32" tapped metal spacers on the large circuit board, with four 6-32 x 9/16" studs.

( ) Refer to the Pictorial and position the receiver circuit board over the shield mounted in the previous step. Check carefully to see that no wire ends touch the shield. If they do touch, cut them off at this time.

( ) Mount the receiver circuit board to the 6-32 x 9/16" studs with four 6-32 x 1/4" screws.

( ) Prepare a 5" length of white hookup wire.

( ) Connect this wire between pin 2 of the 300 μH inductor closest to T402 on the receiver circuit board (S-1) and hole 6 in the large circuit board (S-1). Scrape off the coating from the pin of the inductor to obtain a clean soldering surface.


1-1/2" WHITE WIRE
.001 1.4kV
.001 1.4kV
1
2
3
INSET
2-1/4" WHITE WIRE
YEL-BLK
RED-BLK
YEL
120 VAC WIRING
YEL
GRN-BLK
BLK
AE
1
3
A
LEFT CHASSIS END
5-1/4" WHITE WIRE
1
AF
2
BRAID
100
4" WHITE WIRE
LUG 3
LUG 2
2-1/2" WHITE WIRE
B
SHIELD
BF
BE
VARIABLE TUNING CAPACITOR
C
LUG 1
CAPACITOR BRACKET
1-3/4" WHITE WIRE

PICTORIAL 6-6

Connect the wires coming out of BO #4 as follows:

( ) Green wire to hole 21 (S-1).

( ) Blue wire to hole 20 (S-1).

( ) Violet wire to hole 3 (S-1).

( ) Gray wire to hole 4 (S-1).

( ) Red wire to hole 2 (S-1).

Locate the black shielded cable coming out of BO #5 that is marked with green. Connect this cable as follows:

( ) Inner lead to hole 1 (S-1).

( ) Outer bare lead to hole S, alongside of hole 1 (S-1).

The wire harness will be connected to the large circuit board in the following steps.

( ) Position the receiver circuit board and the wire harness over the large circuit board as shown in Pictorial 6-4.

Locate the black shielded cable coming from BO #1 that is marked with red. Connect this cable to the large circuit board as directed in the next two steps.

( ) Inner lead to the hole marked CAL (S-1).

NOTE: At some locations, there will be no hole in the circuit board. In these cases, as in the next step, solder the lead or wire directly to the foil.

( ) Outer bare lead soldered to the foil as shown in the Pictorial (S-1).

Connect the wire coming out of BO #2 to the large circuit board as follows:

( ) Green wire to hole AGC (S-1).

( ) Yellow wire to hole 1 (S-1).

Locate the black shielded cable coming from BO #3 that is marked with green. Connect this cable to the large circuit board as directed in the next two steps.

( ) Inner lead to hole 4 (S-1).

( ) Outer bare lead soldered to the foil as shown in the Pictorial (S-1).

Connect the blue wire coming from BO #3 to hole 3 (S-1).

( ) Prepare a 1-3/4" length and a 5-1/4" length of white hookup wire.

( ) Connect one end of the 1-3/4" hookup wire to hole 11 in the receiver circuit board (S-1). The other end will be connected later.

( ) Connect one end of the 5-1/4" hookup wire to hole 12 in the receiver circuit board (S-1). The other end will be connected later.

RECEIVER CIRCUIT BOARD INSTALLATION

Refer to Pictorial 6-5 for the following steps.

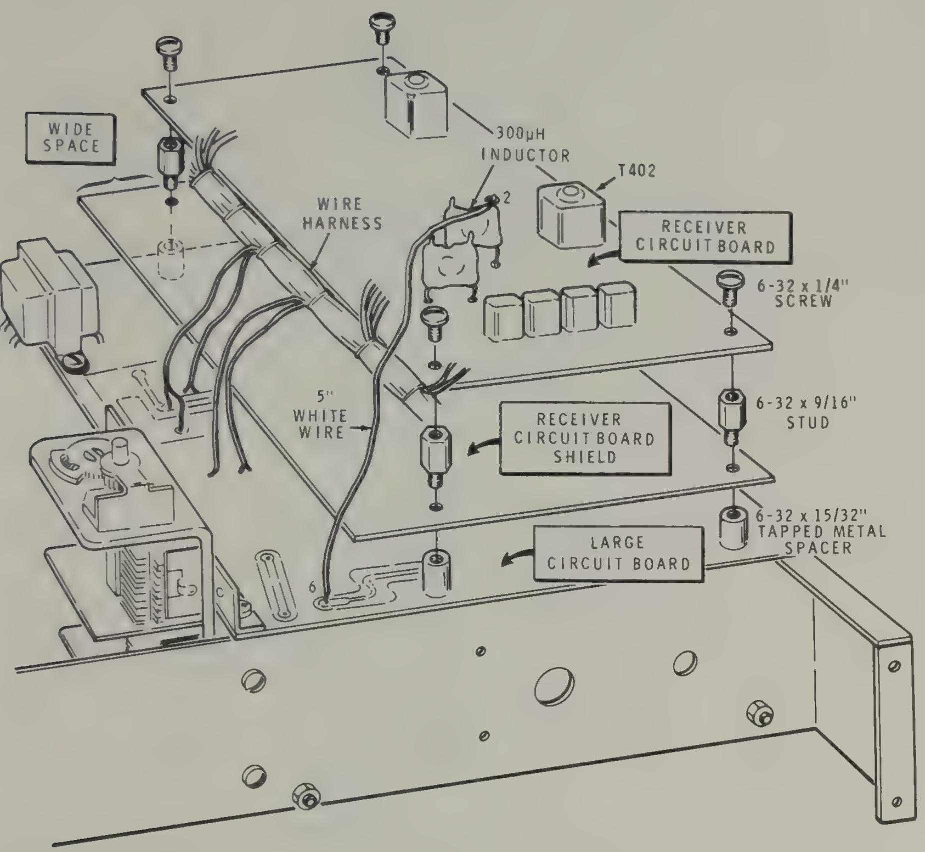
( ) Mount the receiver circuit board shield to the four 6-32 x 15/32" tapped metal spacers on the large circuit board, with four 6-32 x 9/16" studs.

( ) Refer to the Pictorial and position the receiver circuit board over the shield mounted in the previous step. Check carefully to see that no wire ends touch the shield. If they do touch, cut them off at this time.

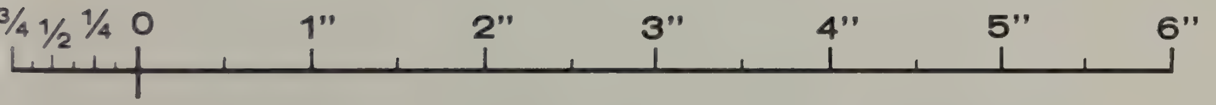
( ) Mount the receiver circuit board to the 6-32 x 9/16" studs with four 6-32 x 1/4" screws.

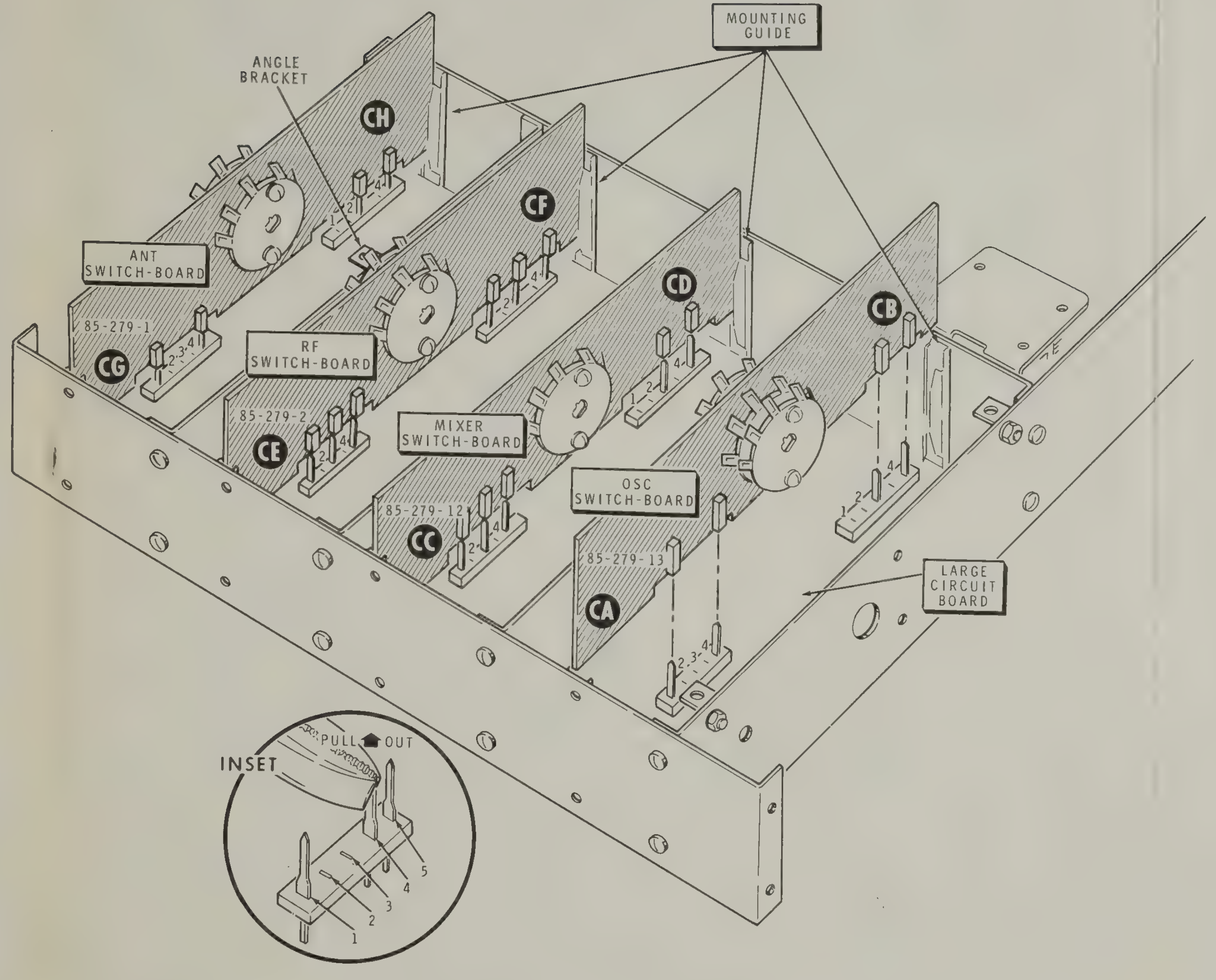
( ) Prepare a 5" length of white hookup wire.

( ) Connect this wire between pin 2 of the 300 µH inductor closest to T402 on the receiver circuit board (S-1) and hole 6 in the large circuit board (S-1). Scrape off the coating from the pin of the inductor to obtain a clean soldering surface.

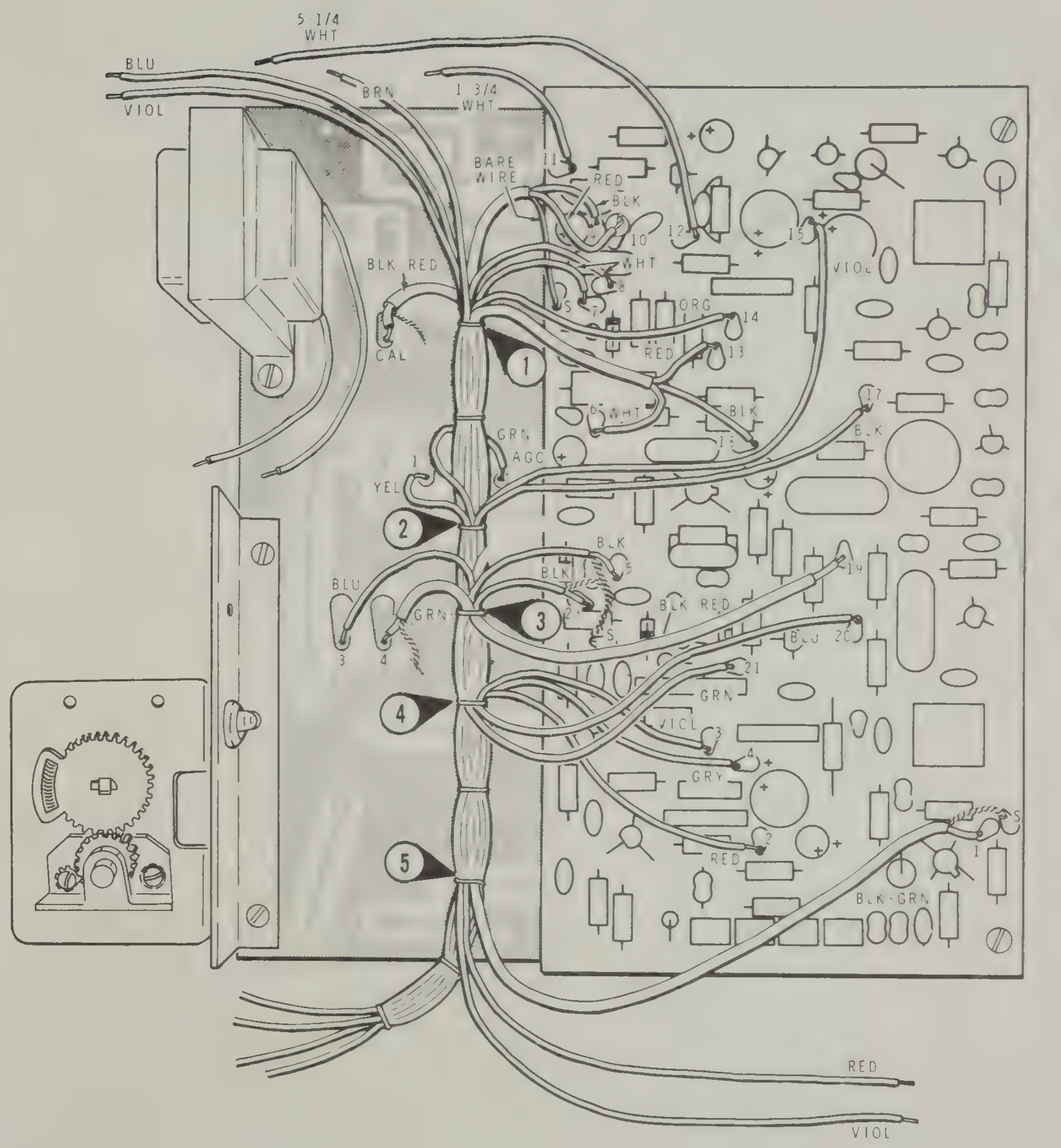

WIDE SPACE
300µH INDUCTOR
T402
WIRE HARNESS
2
RECEIVER CIRCUIT BOARD
6-32 x 1/4" SCREW
5" WHITE WIRE
RECEIVER CIRCUIT BOARD SHIELD
6-32 x 9/16" STUD
6-32 x 15/32" TAPPED METAL SPACER
LARGE CIRCUIT BOARD
6

PICTORIAL 6-5


¾
½
¼
0
1"
2"
3"
4"
5"
6"


MOUNTING GUIDE
ANGLE BRACKET
CH
CF
CD
CB
ANT SWITCH-BOARD
85-279-1
CG
RF SWITCH-BOARD
85-279-2
CE
MIXER SWITCH-BOARD
85-279-12
CC
OSC SWITCH-BOARD
85-279-13
CA
LARGE CIRCUIT BOARD
1
2
3
4
INSET
PULL OUT
5

PICTORIAL 6-3


5 1/4 WHT
BLU
VIOL
BRN
1 3/4 WHT
BARE WIRE
RED
BLK
11
10
12
15
WHT
VIOL
BLK RED
S
7
8
ORG
14
CAL
RED
13
1
6
WHT
BLK
17
GRN
AGC
BLK
YEL
2
BLK
BLK
5
BLU
GRN
3
BLK RED
3
4
S
BLU
20
21
4
GRN
VIOL
3
4
GRY
RED
2
5
S
1
BLK-GRN
RED
VIOL

PICTORIAL 6-4

CHASSIS WIRING

Refer to Pictorial 6-6 (fold-out from this page) for the following steps.

( ) Prepare the following lengths of white hookup wire:

1-3/4"
2-1/2"
4"
5-1/4"
1-1/2"
2-1/4"

NOTE: The wire installed in the next step must be kept as short as possible. Shorten it if necessary.

(✓) Pass the 1-3/4" wire through the small hole in the tuning capacitor bracket as shown in the Pictorial. Connect one end of the wire to lug 1 of the variable tuning capacitor (NS), and the other end of the wire to hole C in the large circuit board (S-1).

(✓) Pass the 2-1/2" wire through the remaining small hole in the capacitor bracket as shown in the Pictorial. Connect the wire from lug 2 of the variable tuning capacitor (S-1) to hole B in the large circuit board (S-1).

(✓) Connect a 4" white wire from lug 3 of the variable tuning capacitor (NS) to hole A in the large circuit board (S-1).

(✓) Connect a 100 pf mica capacitor from lug 3 of the variable tuning capacitor (S-2) to lug 2 of 2-lug terminal strip AF (NS).

(✓) Connect one end of a 5-1/4" white wire to lug 2 of the terminal strip at AF (S-2). The other end of this wire will be connected later.

(✓) Locate the braid and cut off a 2-1/4" length and a 1-1/4" length.

(✓) Solder one end of the 2-1/4" braid to lug 1 of the terminal strip at AF.

NOTE: To avoid shorting out the tuning plates, do not push the braid through the hole in the variable tuning capacitor in the next step.

(✓) Press the free end of the braid coming from terminal strip AF flat against the variable tuning capacitor exactly as shown in the Pictorial. Apply only enough solder to the braid for a good connection. After the solder connection cools, proceed with the next step. NOTE: The center of the braid between the terminal strip lug and the tuning capacitor should be flexible after the braid is installed.

(✓) Rotate the variable tuning capacitor shaft until the capacitor plates fully open and then fully close. While rotating the shaft, watch the capacitor plates to make sure they do not touch the braid.

(✓) Solder one end of the 1-1/4" braid to the #6 solder lug at BE on the capacitor (S-1). Solder the other end of the braid to the large circuit board foil at BF as shown in the Pictorial. NOTE: The center of the braid between the solder lug and the circuit board foil should be flexible after the braid is installed.

Refer to the inset drawing on Pictorial 6-6 for the following steps.

(✓) Cut each lead of a .001 μF 1.4 kV ceramic capacitor to 1/2".

( ) Connect one lead of the capacitor to lug 1 of terminal strip AE (NS). Connect the other lead to lug 2 of terminal strip AE (NS).

( ) Cut each lead of another .001 μF 1.4 kV ceramic capacitor to 1/2".

(✓) Connect one lead of the capacitor to lug 2 of terminal strip AE (S-2). Connect the other lead to lug 3 of terminal strip AE (NS).

(✓) Connect one end of a 1-1/2" white wire to lug 1 of terminal strip AE (NS). The other end will be connected later.

(✓) Connect one end of a 2-1/4" white wire to lug 3 of terminal strip AE (NS). The other end will be connected later.

ALTERNATE LINE VOLTAGE WIRING

Two sets of line voltage wiring instructions are given below, one for 120 VAC line voltage and the other for 240 VAC line voltage. In the U.S.A., 120 VAC is most often used, while in many other countries 240 VAC is more common. USE ONLY THE INSTRUCTIONS THAT AGREE WITH THE LINE VOLTAGE IN YOUR AREA.

20 VAC Wiring

efer to Pictorial 6-6 for the following steps.

✓) Connect the red-black and yellow-black power transformer leads to lug 1 of terminal strip AE (S-4).

✓) Connect the black and green-black power transformer leads to lug 3 of terminal strip AE (S-4).

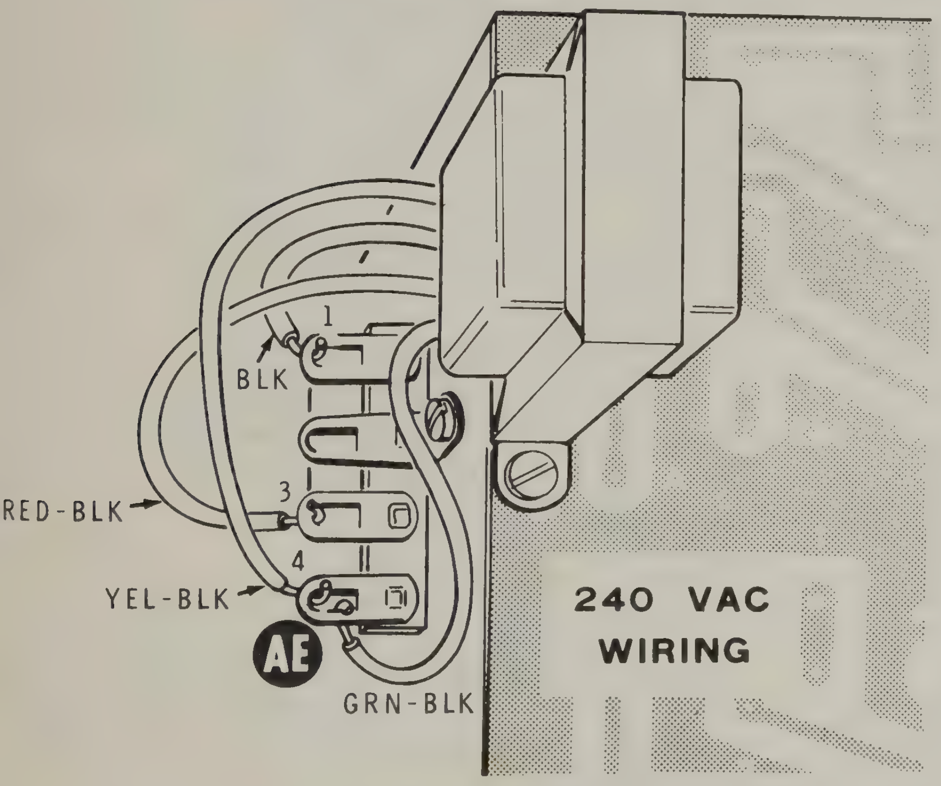
40 VAC Wiring

efer to Detail 6-6A for the following steps.

) Connect the black power transformer lead to lug 1 of terminal strip AE (S-3).

) Connect the red-black power transformer lead to lug 3 of terminal strip AE (S-3).

) Connect the yellow-black and green-black power transformer leads to lug 4 of terminal strip AE (S-2).


1
BLK
RED-BLK
3
4
YEL-BLK
AE
GRN-BLK
240 VAC WIRING

Detail 6-6A

Temporarily set the chassis subassembly aside.

REAR PANEL PARTS MOUNTING AND WIRING

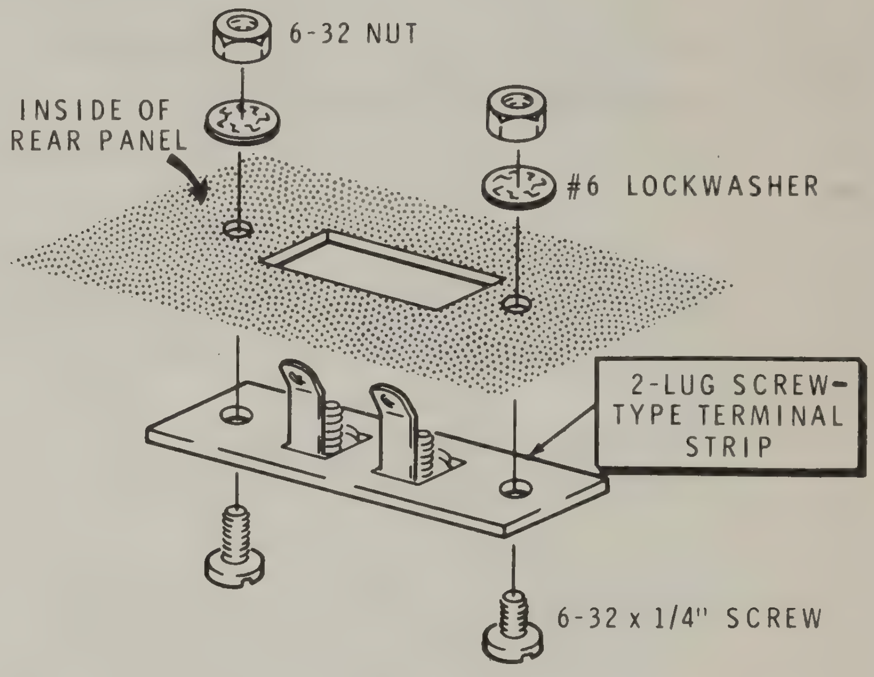
Refer to Pictorial 6-7 (fold-out from Page 48) for the following steps.

(✓) Locate the rear panel and position it as shown in the inset drawing on the Pictorial.

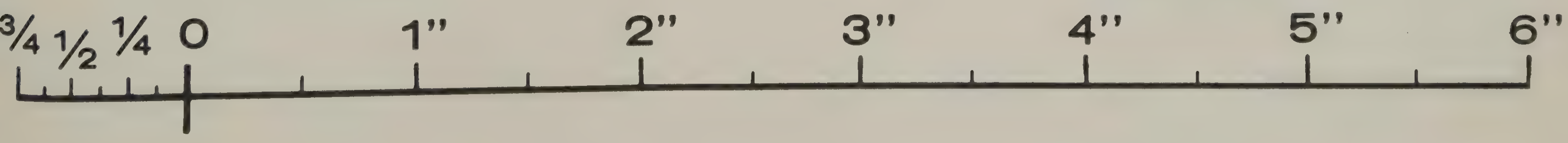
(✓) Position the rear panel on a soft cloth as shown. The soft cloth will prevent the panel from being marred or scratched in the following steps.

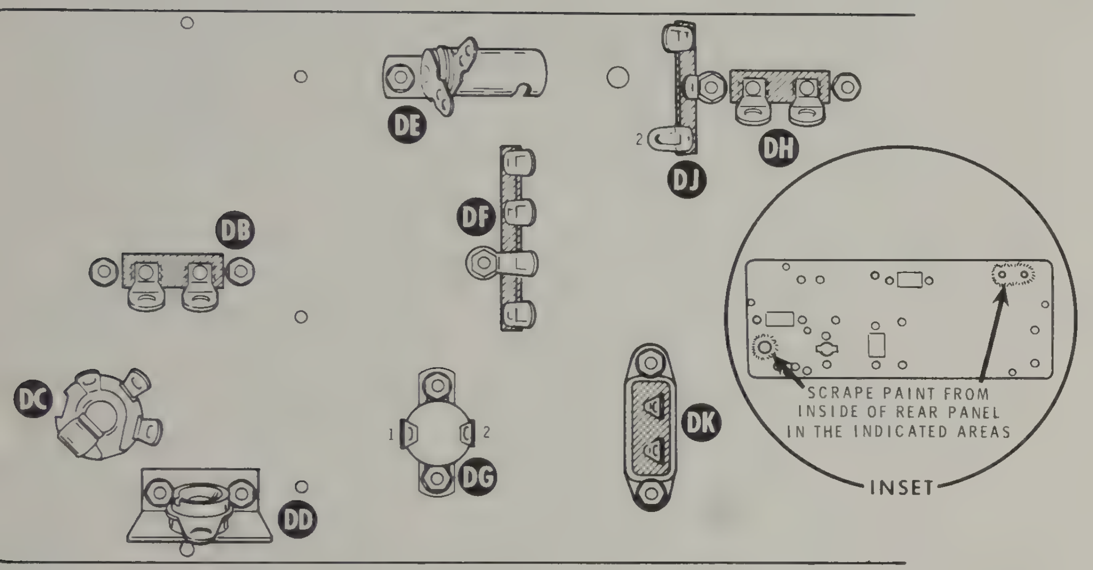
(✓) Refer to the inset drawing and scrape all of the paint off the inside of the rear panel in the two indicated areas. The bare metal provides a better heat transfer and ground connection than a painted surface.

(✓) Refer to Detail 6-7A and mount a 2-lug screw-type terminal strip at DB. Use 6-32 x 1/4" hardware.

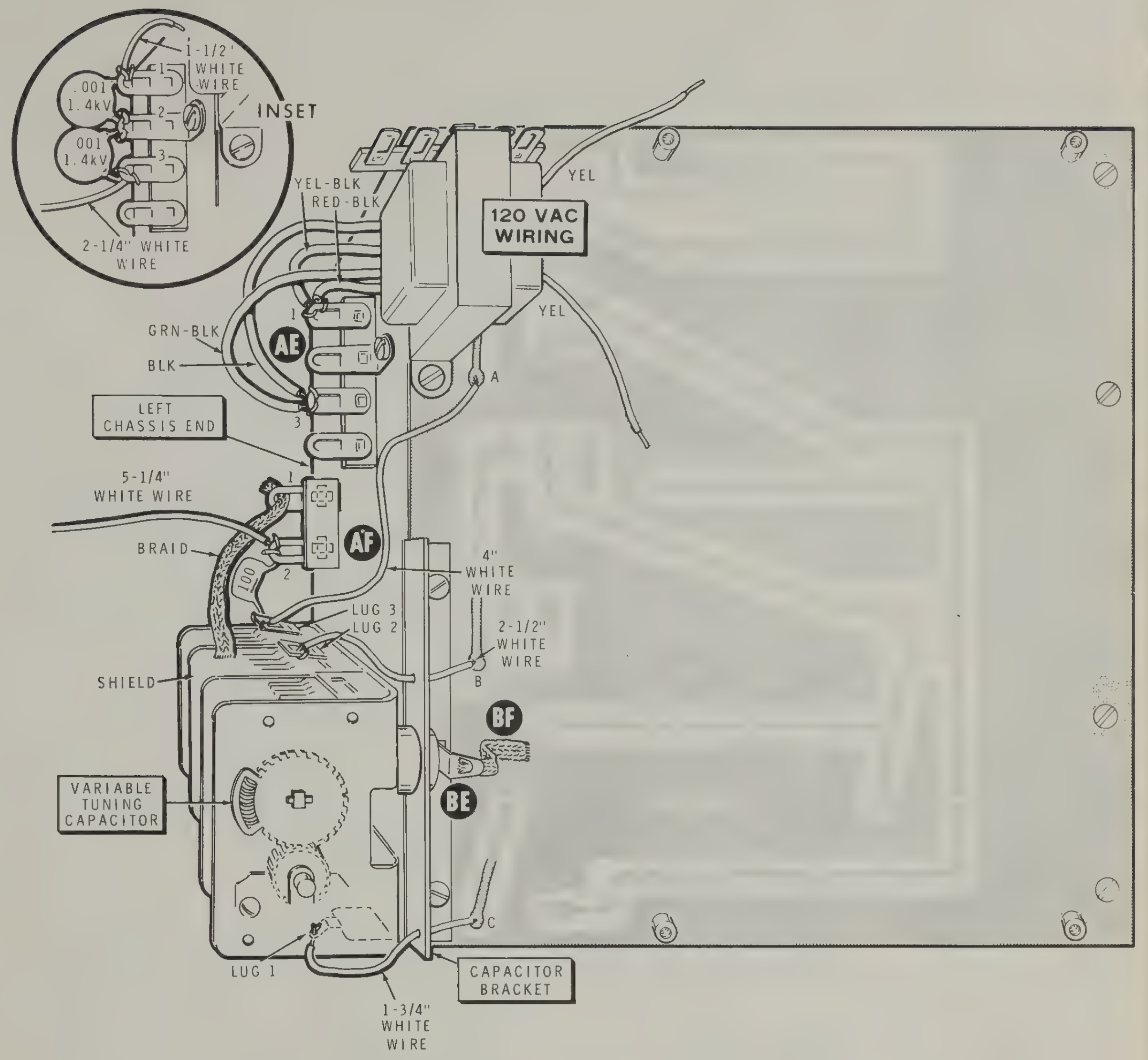

6-32 NUT
INSIDE OF REAR PANEL
#6 LOCKWASHER
2-LUG SCREW-TYPE TERMINAL STRIP
6-32 x 1/4" SCREW

Detail 6-7A


¾
½
¼
0
1"
2"
3"
4"
5"
6"


DE
DJ
DH
DB
DF
DC
DG
DK
DD
1
2
SCRAPE PAINT FROM INSIDE OF REAR PANEL IN THE INDICATED AREAS
INSET

PICTORIAL 6-7


1-1/2" WHITE WIRE
.001 1.4kV
001 1.4kV
1
2
3
INSET
2-1/4" WHITE WIRE
YEL-BLK
RED-BLK
120 VAC WIRING
YEL
YEL
GRN-BLK
BLK
AE
1
3
A
LEFT CHASSIS END
5-1/4" WHITE WIRE
1
AF
BRAID
100
2
4" WHITE WIRE
LUG 3
LUG 2
2-1/2" WHITE WIRE
B
SHIELD
BF
BE
VARIABLE TUNING CAPACITOR
C
LUG 1
CAPACITOR BRACKET
1-3/4" WHITE WIRE

PICTORIAL 6-6

CHASSIS WIRING

Refer to Pictorial 6-6 (fold-out from this page) for the following steps.

( ) Prepare the following lengths of white hookup wire:

1-3/4"	5-1/4"
2-1/2"	1-1/2"
4"	2-1/4"

NOTE: The wire installed in the next step must be kept as short as possible. Shorten it if necessary.

(✓) Pass the 1-3/4" wire through the small hole in the tuning capacitor bracket as shown in the Pictorial. Connect one end of the wire to lug 1 of the variable tuning capacitor (NS), and the other end of the wire to hole C in the large circuit board (S-1).

(✓) Pass the 2-1/2" wire through the remaining small hole in the capacitor bracket as shown in the Pictorial. Connect the wire from lug 2 of the variable tuning capacitor (S-1) to hole B in the large circuit board (S-1).

(✓) Connect a 4" white wire from lug 3 of the variable tuning capacitor (NS) to hole A in the large circuit board (S-1).

(✓) Connect a 100 pf mica capacitor from lug 3 of the variable tuning capacitor (S-2) to lug 2 of 2-lug terminal strip AF (NS).

(✓) Connect one end of a 5-1/4" white wire to lug 2 of the terminal strip at AF (S-2). The other end of this wire will be connected later.

(✓) Locate the braid and cut off a 2-1/4" length and a 1-1/4" length.

(✓) Solder one end of the 2-1/4" braid to lug 1 of the terminal strip at AF.

NOTE: To avoid shorting out the tuning plates, do not push the braid through the hole in the variable tuning capacitor in the next step.

(✓) Press the free end of the braid coming from terminal strip AF flat against the variable tuning capacitor exactly as shown in the Pictorial. Apply only enough solder to the braid for a good connection. After the solder connection cools, proceed with the next step. NOTE: The center of the braid between the terminal strip lug and the tuning capacitor should be flexible after the braid is installed.

(✓) Rotate the variable tuning capacitor shaft until the capacitor plates fully open and then fully close. While rotating the shaft, watch the capacitor plates to make sure they do not touch the braid.

(✓) Solder one end of the 1-1/4" braid to the #6 solder lug at BE on the capacitor (S-1). Solder the other end of the braid to the large circuit board foil at BF as shown in the Pictorial. NOTE: The center of the braid between the solder lug and the circuit board foil should be flexible after the braid is installed.

Refer to the inset drawing on Pictorial 6-6 for the following steps.

(✓) Cut each lead of a .001 µF 1.4 kV ceramic capacitor to 1/2".

(✓) Connect one lead of the capacitor to lug 1 of terminal strip AE (NS). Connect the other lead to lug 2 of terminal strip AE (NS).

(✓) Cut each lead of another .001 µF 1.4 kV ceramic capacitor to 1/2".

(✓) Connect one lead of the capacitor to lug 2 of terminal strip AE (S-2). Connect the other lead to lug 3 of terminal strip AE (NS).

(✓) Connect one end of a 1-1/2" white wire to lug 1 of terminal strip AE (NS). The other end will be connected later.

(✓) Connect one end of a 2-1/4" white wire to lug 3 of terminal strip AE (NS). The other end will be connected later.

ALTERNATE LINE VOLTAGE WIRING

Two sets of line voltage wiring instructions are given below, one for 120 VAC line voltage and the other for 240 VAC line voltage. In the U.S.A., 120 VAC is most often used, while in many other countries 240 VAC is more common. USE ONLY THE INSTRUCTIONS THAT AGREE WITH THE LINE VOLTAGE IN YOUR AREA.

120 VAC Wiring

Refer to Pictorial 6-6 for the following steps.

(✓) Connect the red-black and yellow-black power transformer leads to lug 1 of terminal strip AE (S-4).

(✓) Connect the black and green-black power transformer leads to lug 3 of terminal strip AE (S-4).

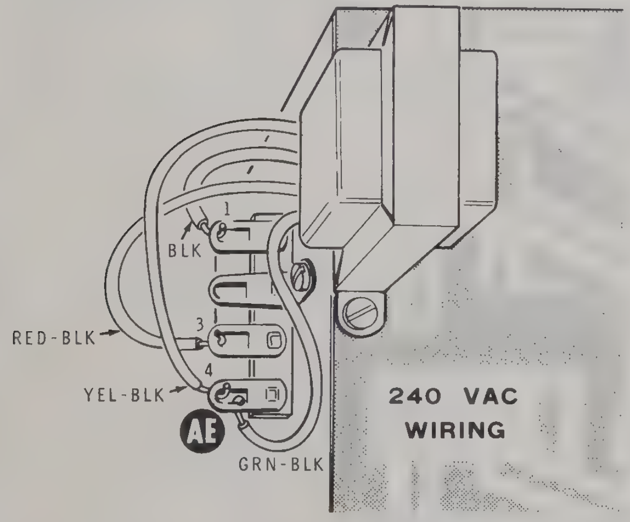
240 VAC Wiring

Refer to Detail 6-6A for the following steps.

( ) Connect the black power transformer lead to lug 1 of terminal strip AE (S-3).

( ) Connect the red-black power transformer lead to lug 3 of terminal strip AE (S-3).

( ) Connect the yellow-black and green-black power transformer leads to lug 4 of terminal strip AE (S-2).


1
BLK
3
RED-BLK
4
YEL-BLK
AE
GRN-BLK
240 VAC WIRING

Detail 6-6A

Temporarily set the chassis subassembly aside.

REAR PANEL PARTS MOUNTING AND WIRING

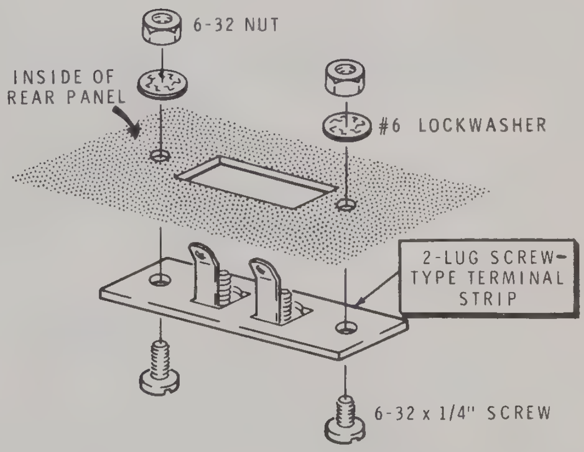
Refer to Pictorial 6-7 (fold-out from Page 48) for the following steps.

(✓) Locate the rear panel and position it as shown in the inset drawing on the Pictorial.

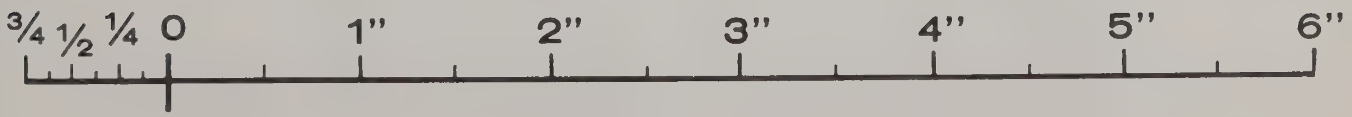
(✓) Position the rear panel on a soft cloth as shown. The soft cloth will prevent the panel from being marred or scratched in the following steps.

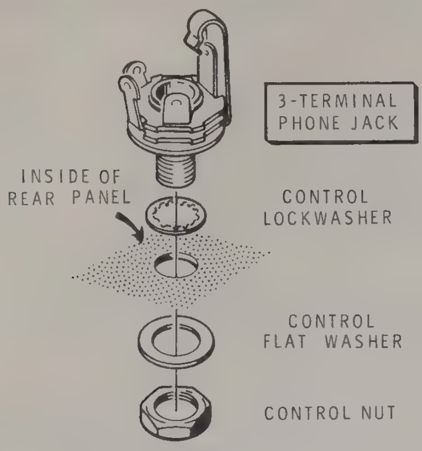
(✓) Refer to the inset drawing and scrape all of the paint off the inside of the rear panel in the two indicated areas. The bare metal provides a better heat transfer and ground connection than a painted surface.

(✓) Refer to Detail 6-7A and mount a 2-lug screw-type terminal strip at DB. Use 6-32 x 1/4" hardware.

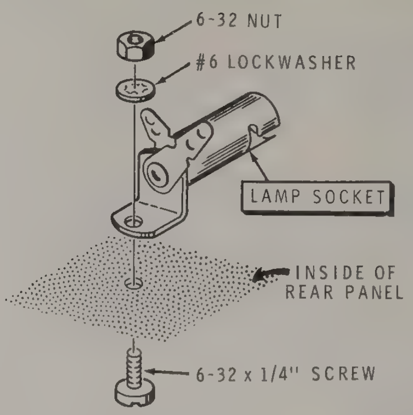

6-32 NUT
INSIDE OF REAR PANEL
#6 LOCKWASHER
2-LUG SCREW-TYPE TERMINAL STRIP
6-32 x 1/4" SCREW

Detail 6-7A


3/4
1/2
1/4
0
1"
2"
3"
4"
5"
6"


3-TERMINAL PHONE JACK
INSIDE OF REAR PANEL
CONTROL LOCKWASHER
CONTROL FLAT WASHER
CONTROL NUT

Detail 6-7B


6-32 NUT
#6 LOCKWASHER
LAMP SOCKET
INSIDE OF REAR PANEL
6-32 x 1/4" SCREW

Detail 6-7D

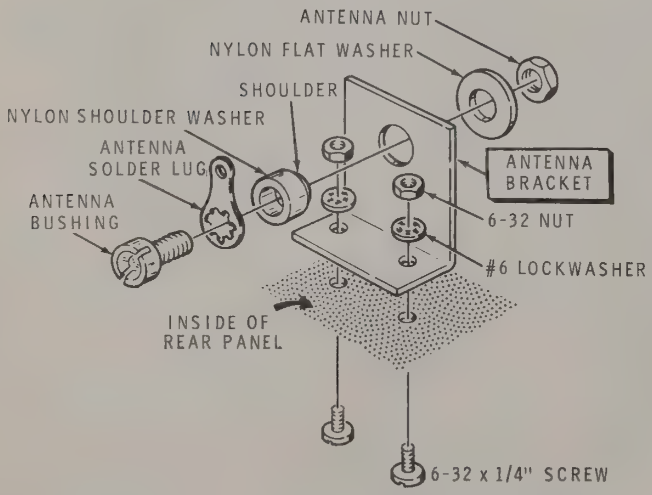
(✓) Refer to Detail 6-7B and mount the 3-terminal phone jack at DC with a control lockwasher, a control flat washer, and a control nut. Position the jack as shown in the Pictorial.

( ) Refer to Detail 6-7C and mount the antenna bracket to the rear panel at DD with 6-32 x 1/4" hardware.

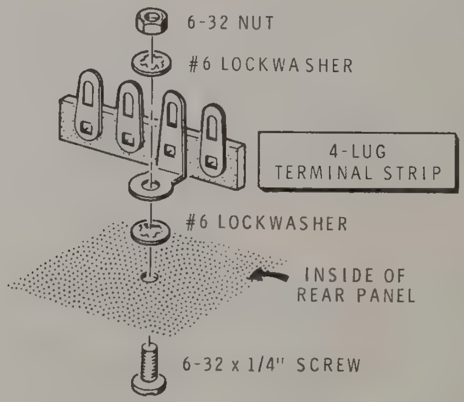
( ) Refer to the same Detail and mount an antenna bushing on the antenna bracket with an antenna solder lug, a nylon shoulder washer, a nylon flat washer, and an antenna nut. Be sure the nylon shoulder washer is properly seated.

(✓) Refer to Detail 6-7D and mount the lamp socket at DE with 6-32 x 1/4" hardware.

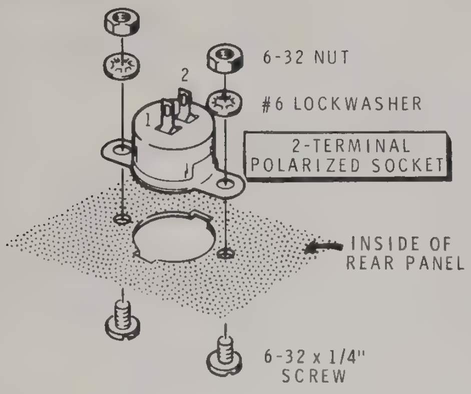
(✓) Refer to Detail 6-7E and mount the 4-lug terminal strip at DF with 6-32 x 1/4" hardware.


ANTENNA NUT
NYLON FLAT WASHER
SHOULDER
NYLON SHOULDER WASHER
ANTENNA SOLDER LUG
ANTENNA BUSHING
ANTENNA BRACKET
6-32 NUT
#6 LOCKWASHER
INSIDE OF REAR PANEL
6-32 x 1/4" SCREW

Detail 6-7C

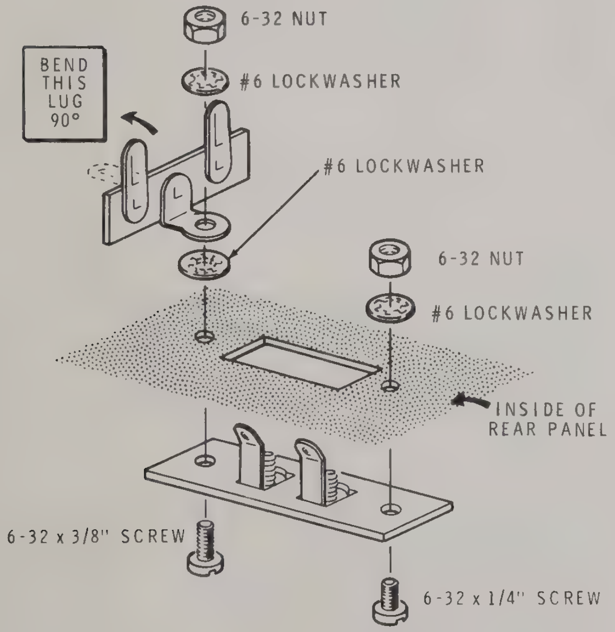

6-32 NUT
#6 LOCKWASHER
4-LUG TERMINAL STRIP
#6 LOCKWASHER
INSIDE OF REAR PANEL
6-32 x 1/4" SCREW

Detail 6-7E

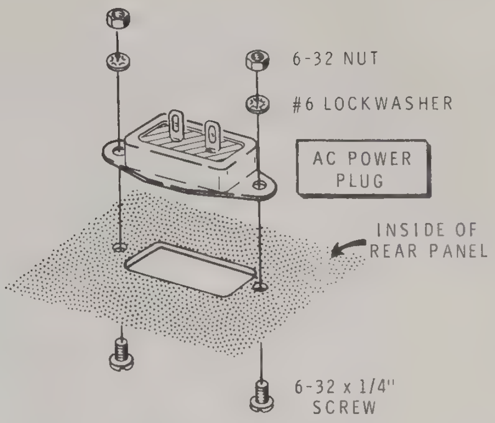

6-32 NUT
#6 LOCKWASHER
2
1
2-TERMINAL POLARIZED SOCKET
INSIDE OF REAR PANEL
6-32 x 1/4" SCREW

Detail 6-7F

( ) Mount the 2-terminal polarized socket at DG with 6-32 x 1/4" hardware as shown in Detail 6-7F. Position the lugs as shown. The lug numbers are molded in the socket.


6-32 NUT
BEND THIS LUG 90°
#6 LOCKWASHER
#6 LOCKWASHER
6-32 NUT
#6 LOCKWASHER
INSIDE OF REAR PANEL
6-32 x 3/8" SCREW
6-32 x 1/4" SCREW

Detail 6-7G


6-32 NUT
#6 LOCKWASHER
AC POWER PLUG
INSIDE OF REAR PANEL
6-32 x 1/4" SCREW

Detail 6-7H

(✓) Mount the other 2-lug screw-type terminal strip at DH with a 2-lug terminal strip at DJ as shown in Detail 6-7G. Use 6-32 x 3/8" hardware at DJ. Use 6-32 x 1/4" hardware to mount the other side of the terminal strip at DH. Position the terminal strip as shown in the Pictorial.

(✓) Bend the indicated lug of 2-lug terminal strip DJ as shown in the Detail.

(✓) Refer to Detail 6-7H and mount the AC power plug at DK with 6-32 x 1/4" hardware.

Refer to Pictorial 6-8 for the following steps.

( ) Connect a 1-1/4" length of bare wire from lug 1 of terminal strip DB (S-1) to lug 1 of phone jack DC (NS).

( ) Connect a 100 Ω (brown-black-brown) resistor between lug 1 (NS) and lug 3 (NS) of phone jack DC.

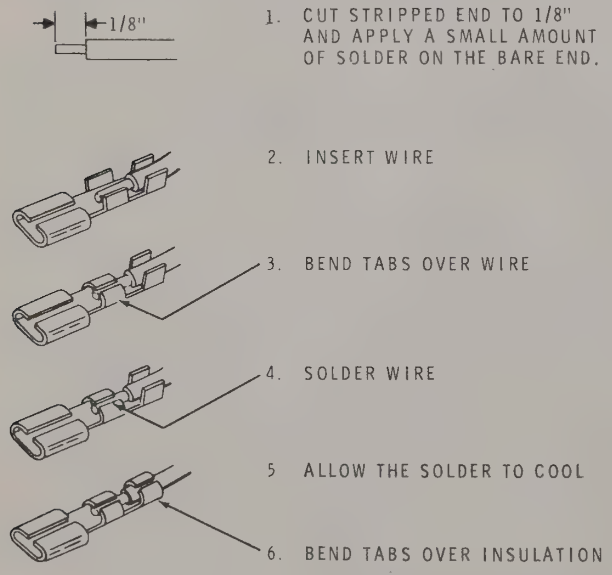
( ) Prepare the following lengths of white hookup wire:

8"
8"
2-1/4"

( ) Connect an 8" white wire to lug 1 of phone jack DC (S-3). The other end will be connected later.

( ) Connect an 8" wire to lug 2 of phone jack DC (S-1). The other end will be connected later.

( ) Refer to Detail 6-8A and install a speaker connector on the free end of each 8" white hookup wire coming from phone jack DC. Do not allow the solder to run beyond the neck and into the push-on section of the connector.



1. CUT STRIPPED END TO 1/8" AND APPLY A SMALL AMOUNT OF SOLDER ON THE BARE END.
2. INSERT WIRE
3. BEND TABS OVER WIRE
4. SOLDER WIRE
5 ALLOW THE SOLDER TO COOL
6. BEND TABS OVER INSULATION

Detail 6-8A

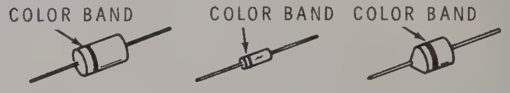
( ) Remove a 1" length and a 1/2" length of insulation from the white hookup wire.

( ) Install the 1/2" length of insulation on one lead of a 12 pf mica capacitor and connect this lead to lug 2 of terminal strip DB (S-1).

( ) Install the 1" length of insulation on the other lead of the 12 pf mica capacitor and connect this lead to antenna solder lug DD (NS).

( ) Locate a silicon diode (#57-65). Refer to Detail 6-8B and identify the cathode end of the diode.

NOTE: WHEN INSTALLING SILICON DIODES, THE CATHODE END MUST BE PLACED AS DIRECTED. THE CATHODE END IS MARKED WITH A COLOR BAND OR BANDS.



Detail 6-8B

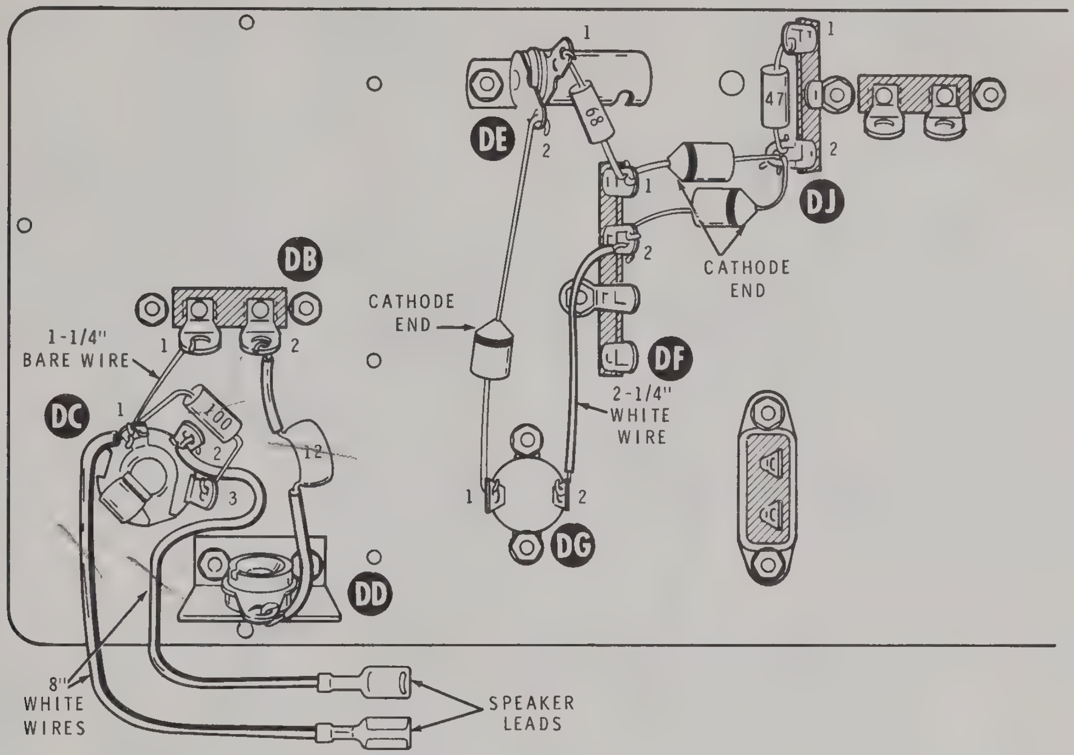
( ) Connect the cathode end lead of the diode to lug 2 of lamp socket DE (S-1).

( ) Connect the other lead to lug 1 of polarized plug DG (S-1).

( ) Connect a 68 Ω (blue-gray-black) resistor from lug 1 of lamp socket DE (S-1) to lug 1 of terminal strip DF (NS).

( ) Locate the two remaining diodes (#57-65). Refer to Detail 6-8B and identify the cathode ends of the diodes.

3/4
1/2
1/4
0
1"
2"
3"
4"
5"
6"


1
DE
2
68
1
47
2
DJ
1
2
CATHODE END
DB
1-1/4" BARE WIRE
1
2
CATHODE END
DF
2-1/4" WHITE WIRE
DC
1
100
2
12
3
1
2
DG
DD
8" WHITE WIRES
SPEAKER LEADS

PICTORIAL 6-8

( ) Connect the cathode end lead of one diode to lug 1 of terminal strip DF (NS).

( ) Connect the other lead to lug 2 of terminal strip DJ (NS).

( ) Form the leads of the second diode as shown in the Pictorial.

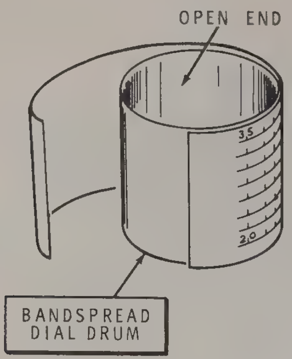
( ) Connect the cathode end lead of this diode to lug 2 of terminal strip DJ (NS).

( ) Connect the other lead to lug 2 of terminal strip DF (NS).

( ) Connect a 2-1/4" white wire from lug 2 of terminal strip DF (NS) to lug 2 of the polarized plug DG (NS).

( ) Connect a 47 Ω (yellow-violet-black) resistor between lug 1 (NS) and lug 2 (S-3) of terminal strip DJ.

( ) Set the rear panel aside temporarily.


OPEN END
35
20
BANDSPREAD DIAL DRUM

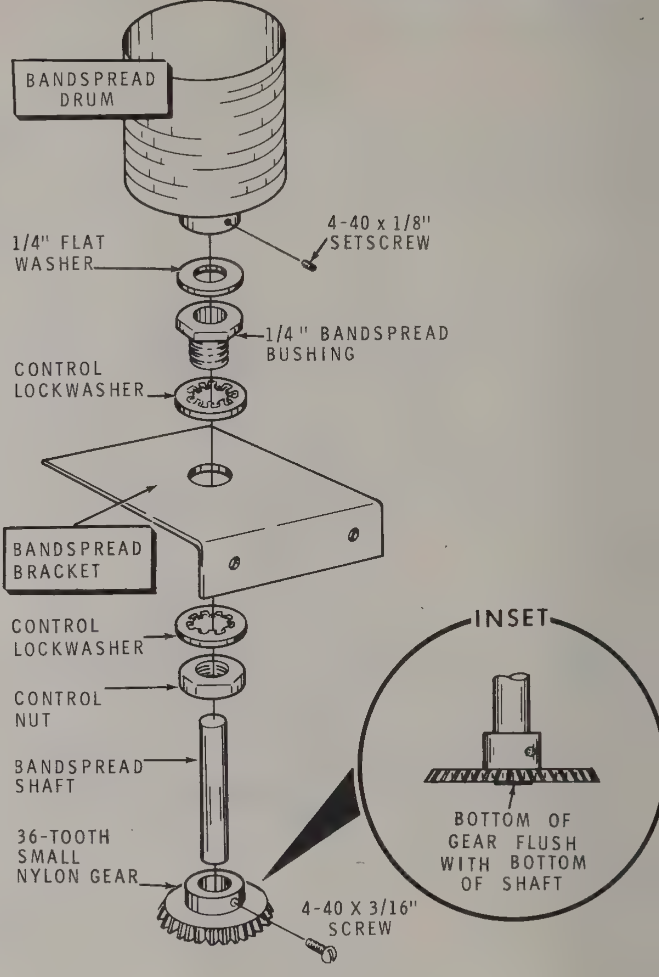
Detail 6-9A

Refer to Pictorial 6-9 (fold-out from Page 59) for the following steps.

NOTE: Two bandspread labels are provided: #390-252 is calibrated for the amateur bands, and #390-253 is calibrated for the commercial short-wave bands. Use either one according to your preference.

( ) Remove the paper backing from the selected bandspread label and attach the label to the bandspread dial drum as shown in Detail 6-9A.

Refer to Detail 6-9B for the following steps.


BANDSPREAD DRUM
4-40 x 1/8" SETSCREW
1/4" FLAT WASHER
1/4" BANDSPREAD BUSHING
CONTROL LOCKWASHER
BANDSPREAD BRACKET
CONTROL LOCKWASHER
CONTROL NUT
BANDSPREAD SHAFT
36-TOOTH SMALL NYLON GEAR
4-40 X 3/16" SCREW
INSET
BOTTOM OF GEAR FLUSH WITH BOTTOM OF SHAFT

Detail 6-9B

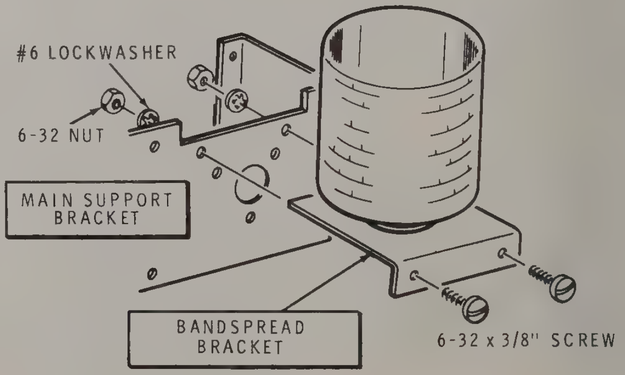
CAUTION: You can very easily strip the threads in the screw holes in the nylon gears when you mount them on their shafts in two of the following steps. Therefore, DO NOT OVERTIGHTEN THE SCREWS when you secure the gears on their shafts.

( ) Locate the bandspread bracket and install the 1/4" bandspread bushing with two control lockwashers and a control nut as shown in the Detail.

( ) Attach the 36-tooth small nylon gear to the bandspread shaft with a 4-40 x 3/16" screw. The bottom of the gear should be flush with the bottom of the shaft as shown in the inset drawing. DO NOT OVERTIGHTEN THE SETSCREW.

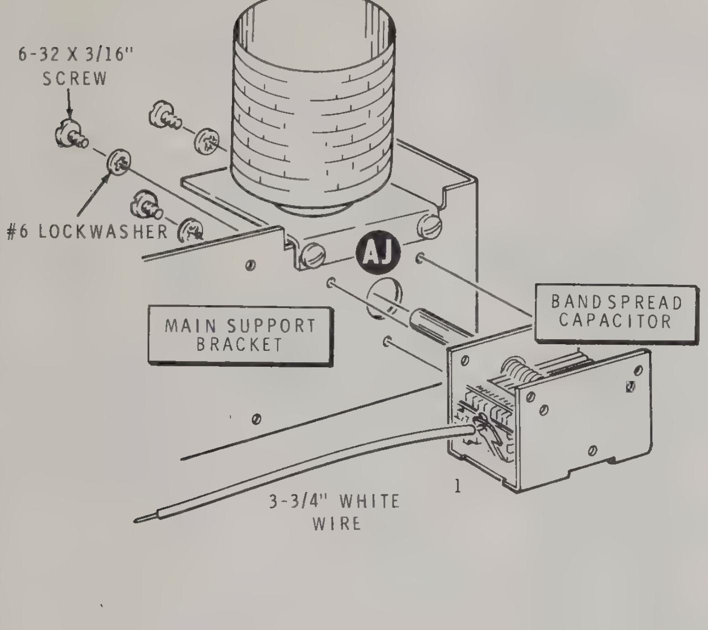
( ) Insert the bandspread shaft into the bandspread bushing. Then install the 1/4" flat washer and attach the bandspread dial drum to the shaft with a 4-40 x 1/8" setscrew.

( ) Refer to Detail 6-9C and attach the bandspread bracket assembly to the main support bracket with 6-32 x 3/8" hardware.

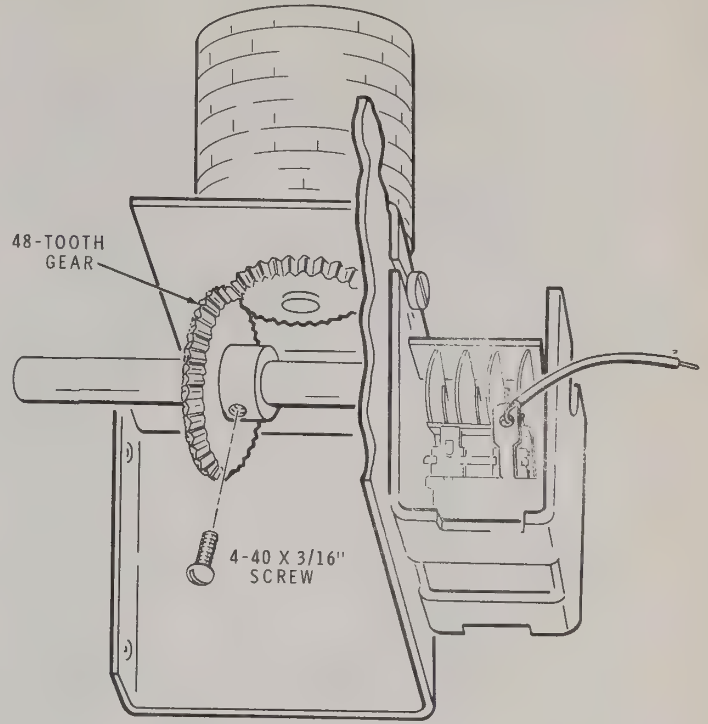

#6 LOCKWASHER
6-32 NUT
MAIN SUPPORT BRACKET
BANDSPREAD BRACKET
6-32 x 3/8" SCREW

Detail 6-9C

¾
½
¼
0
1"
2"
3"
4"
5"
6"



Detail 6-9D



Detail 6-9E

Refer to Detail 6-9D for the following steps.

( ) Locate the bandspread capacitor (#26-127) and bend lug 1 up as shown.

( ) Prepare 3-3/4" length of white hookup wire. Connect one end to lug 1 of the bandspread capacitor (S-1). The other end of this wire will be connected later.

( ) Mount the bandspread capacitor to the main support bracket at AJ with three 6-32 x 3/16" screws and #6 lockwashers.

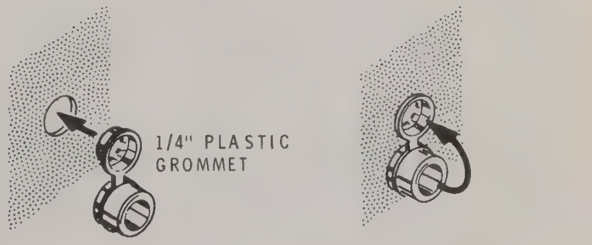
Refer to Pictorial 6-9 (fold-out from Page 59) for the following steps.

( ) Refer to Detail 6-9E and mount the 48-tooth nylon gear to the bandspread capacitor shaft with a 4-40 x 3/16" screw. The two bevel gears should mesh and run smoothly. DO NOT OVERTIGHTEN THE SETSCREW.

( ) Refer to Detail 6-9F and install 1/4" plastic grommets at AK and AL in the speaker shield.

( ) Pass the wire attached to the bandspread capacitor through grommet AL in the speaker shield, and use two #6 x 1/4" sheet metal screws to mount the speaker shield to the main support bracket. Be sure the lug of the capacitor does not touch the speaker shield.

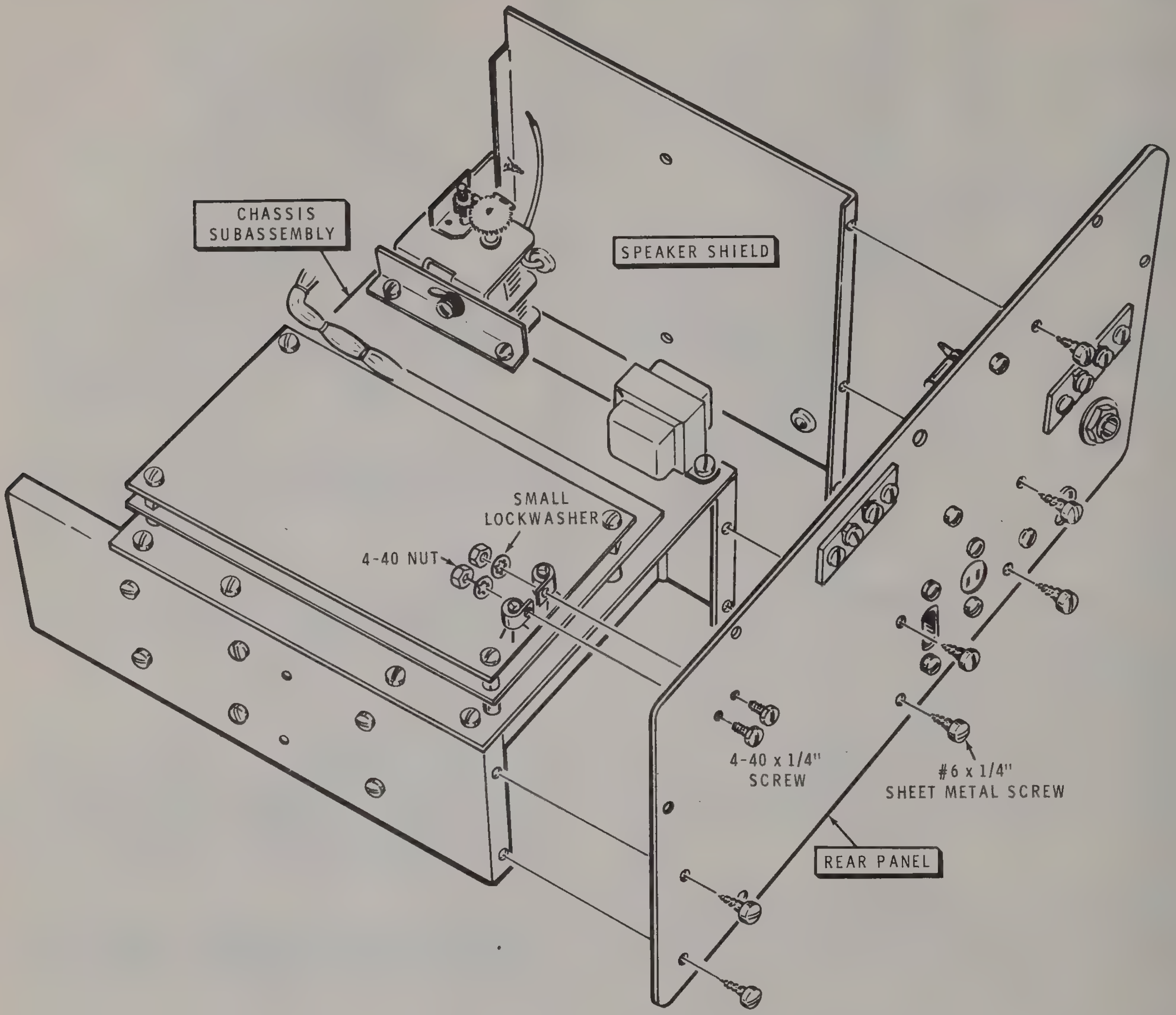
( ) Connect the free end of this wire, coming from the bandspread capacitor, to lug 1 of the variable tuning capacitor (S-2). Refer to the inset drawing on Pictorial 6-9.



POSITION THE SMALL PORTION OF THE GROMMET INTO THE SPEAKER SHIELD HOLE.

BEND THE LARGE PORTION OF THE GROMMET OVER AND INTO THE SMALL PORTION. PRESS IT FIRMLY INTO PLACE.

Detail 6-9F


CHASSIS SUBASSEMBLY
SPEAKER SHIELD
SMALL LOCKWASHER
4-40 NUT
4-40 x 1/4" SCREW
#6 x 1/4" SHEET METAL SCREW
REAR PANEL

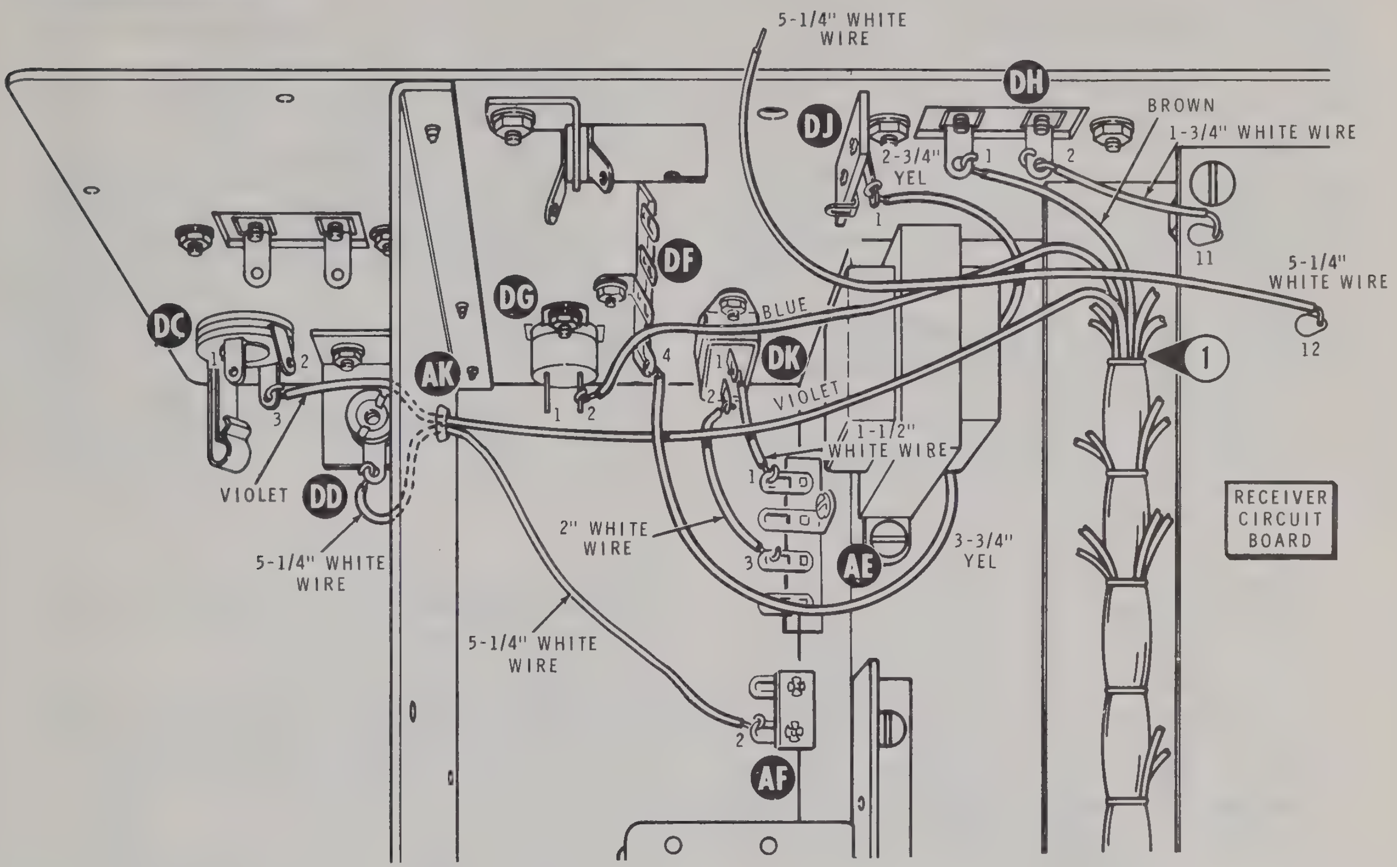
Detail 6-9G

Refer to Detail 6-9G for the following steps.

(✓) Position the chassis subassembly and rear panel as shown.

(✓) Mount the rear panel to the chassis subassembly and speaker shield with seven #6 x 1/4" sheet metal screws. Be careful not to pinch any wires when tightening the screws. Be sure the resistor mounted on the rear panel does not touch the power transformer.

(✓) Mount the two transistor heat sinks on the rear panel with 4-40 x 1/4" hardware.


5-1/4" WHITE WIRE
DH
DJ
2-3/4" YEL
1
2
BROWN
1-3/4" WHITE WIRE
11
5-1/4" WHITE WIRE
12
①
DF
DG
BLUE
DK
DC
AK
4
1
2
VIOLET
1-1/2" WHITE WIRE
3
VIOLET
DD
5-1/4" WHITE WIRE
2" WHITE WIRE
AE
3-3/4" YEL
RECEIVER CIRCUIT BOARD
5-1/4" WHITE WIRE
AF

PICTORIAL 6-10

Refer to Pictorial 6-10 for the following steps.

( ) Connect the white wire from hole 11 in the receiver circuit board to lug 2 of terminal strip DH (S-1).

( ) Connect the brown wire from BO #1 of the wire harness to lug 1 of terminal strip DH (S-1).

( ) Connect the blue wire from BO #1 to lug 2 of polarized socket DG (S-2).

( ) Pass the violet wire from BO #1 through grommet AK and connect it to lug 3 of phone jack DC (S-2).

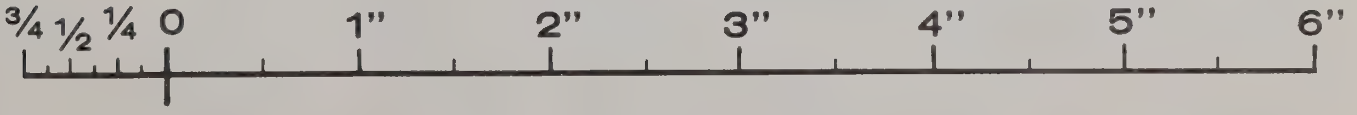
( ) Pass the white wire from lug 2 of terminal strip AF through grommet AK and connect it to antenna solder lug DD (S-2).

( ) Connect the 2-3/4" yellow power transformer lead to lug 1 of terminal strip DJ (S-2).

( ) Connect the 3-3/4" yellow power transformer lead to lug 4 of terminal strip DF (NS).

( ) Connect the free end of the 1-1/2" white wire coming from lug 1 of terminal strip AE to lug 1 of AC power socket DK (S-1).

( ) Connect the free end of the 2-1/4" white wire coming from lug 3 of terminal strip AE to lug 2 of AC power socket DK (S-1).


¾
½
¼
0
1"
2"
3"
4"
5"
6"

FRONT PANEL PARTS MOUNTING AND WIRING

Refer to Pictorial 6-11 (fold-out from Page 59) for the following steps.

NOTE: Five DPDT rocker switches, one with spring return, will be mounted in the next step. Be sure to position each switch exactly as shown.

( ) Refer to Detail 6-11A and mount an SPST rocker switch with spring return (#60-46) at EA with two 4-40 x 1/4" screws.

( ) Refer to the inset drawing in Pictorial 6-11 and prepare four DPDT rocker switches (60-48) by cutting off lugs 3, 4, 5, and 6.

( ) Mount a prepared rocker switch at EB with two 4-40 x 1/4" screws.

( ) Mount a prepared rocker switch at EC with two 4-40 x 1/4" screws.

( ) Mount the remaining unprepared rocker switch (60-48) at ED with two 4-40 x 1/4" screws and one #6 solder lug. Position the solder lug as shown.

( ) Mount a prepared rocker switch at EE with two 4-40 x 1/4" screws.

( ) Mount a prepared rocker switch at EF with two 4-40 x 1/4" screws.

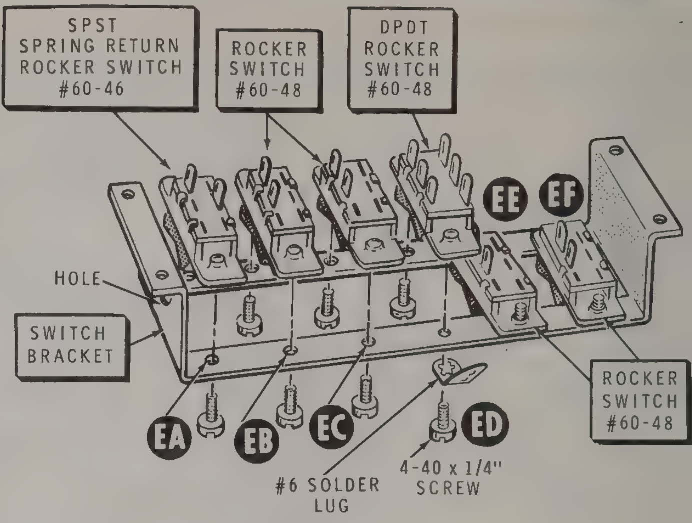
( ) Position the switch bracket and the chassis subassembly as shown in the Pictorial.

( ) Prepare a 3" length of white hookup wire by removing 1/4" of insulation from one end and 3/4" from the other end.

NOTE: When a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the soldering instructions (S-2), one entering and one leaving the connection.

( ) Insert the end with 3/4" insulation removed through lug 2 of switch EC (S-2) to lug 2 of switch ED (S-1). Connect the other end to lug 2 of switch EA (NS).

( ) Cut each lead of the 1000 Ω (brown-black-red) resistor to 1/2". Connect the resistor from lug 2 of switch EA (NS) to lug 2 of switch EB (NS).



Detail 6-11A

( ) Cut the positive lead of a 50 μF electrolytic capacitor to 3/4" and the other lead to 1-1/4".

( ) Remove a 1" length and a 1/2" length of insulation from the white hookup wire. Place the 1" length of insulation on the 1-1/4" capacitor lead. Place the 1/2" length of insulation on the 3/4" positive lead.

( ) Connect the 3/4" positive capacitor lead to lug 2 of switch EB (S-2). Connect the 1-1/4" lead to the #6 solder lug at ED (NS).

( ) Prepare a 6" length of white hookup wire and connect one end to lug 1 of switch EA (S-1). The other end will be connected later.

Connect the following wires from BO #5 of the wire harness to the switches:

( ) Gray wire to lug 2 of switch EA (S-3).

( ) Brown wire to lug 1 of switch EB (S-1).

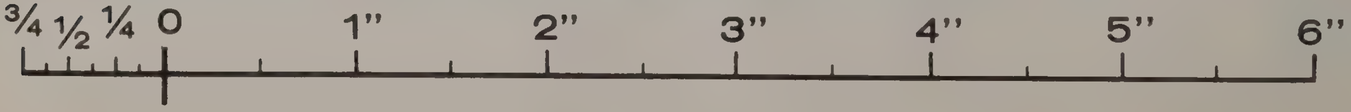
( ) Black wire to lug 1 of switch EC (S-1).

( ) Orange wire to lug 3 of switch ED (S-1).

Locate the gray shielded cable coming from BO #5 of the chassis subassembly wire harness. This cable has a red lead, a black lead, a white lead, and an outer bare lead. Connect the leads of the cable as follows:

( ) White lead to lug 4 of switch ED (S-1).

( ) Red lead to lug 5 of switch ED (S-1).



( ) Black lead to lug 6 of switch ED (S-1).

( ) Outer bare lead to the solder lug at ED (NS).

Locate the two black shielded cables from BO #5 and connect them as follows:

( ) Inner lead from either black cable to lug 1 of switch EE (S-1).

( ) Inner lead from other black cable to lug 2 of switch EE (S-1).

( ) Connect the outer bare leads from both cables to the solder lug at ED (S-4).

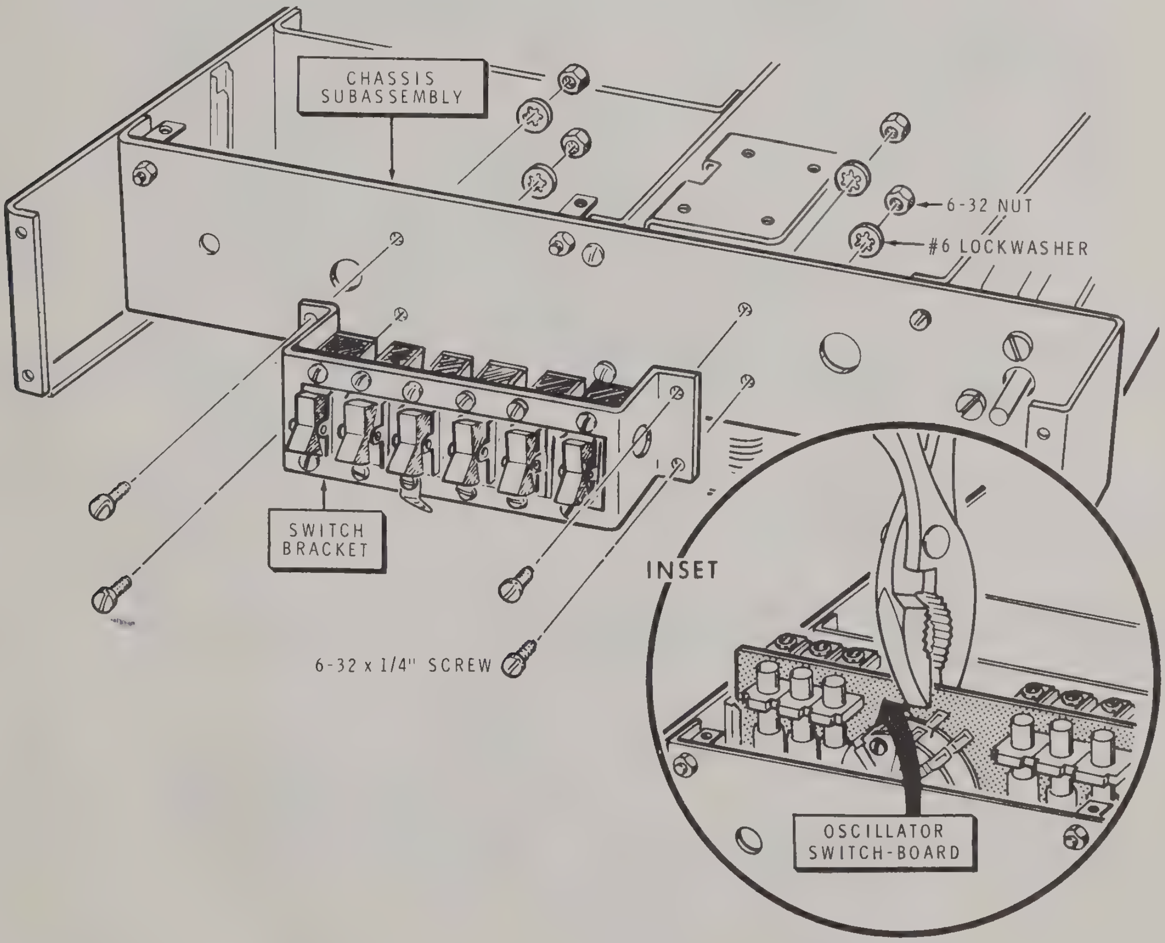
( ) Either white wire to lug 1 of switch EF (S-1).

( ) Other white wire to lug 2 of switch EF (S-1).

NOTE: It will be necessary to remove the OSCillator Switch-Board (#85-279-13) from the chassis before performing the next step. Remove the Switch-Board by carefully pulling on it with pliers as shown in the inset drawing and Detail 6-11B.

( ) Refer to Detail 6-11B and turn the chassis subassembly over as shown. Then mount the switch bracket to the chassis subassembly with 6-32 x 1/4" hardware.

( ) Replace the oscillator Switch-Board in the chassis.


CHASSIS SUBASSEMBLY
6-32 NUT
#6 LOCKWASHER
SWITCH BRACKET
INSET
6-32 x 1/4" SCREW
OSCILLATOR SWITCH-BOARD

Detail 6-11B

FRONT PANEL PARTS MOUNTING AND WIRING

Refer to Pictorial 6-11 (fold-out from Page 59) for the following steps.

NOTE: Five DPDT rocker switches, one with spring return, will be mounted in the next step. Be sure to position each switch exactly as shown.

( ) Refer to Detail 6-11A and mount an SPST rocker switch with spring return (#60-46) at EA with two 4-40 x 1/4" screws.

( ) Refer to the inset drawing in Pictorial 6-11 and prepare four DPDT rocker switches (60-48) by cutting off lugs 3, 4, 5, and 6.

( ) Mount a prepared rocker switch at EB with two 4-40 x 1/4" screws.

( ) Mount a prepared rocker switch at EC with two 4-40 x 1/4" screws.

( ) Mount the remaining unprepared rocker switch (60-48) at ED with two 4-40 x 1/4" screws and one #6 solder lug. Position the solder lug as shown.

( ) Mount a prepared rocker switch at EE with two 4-40 x 1/4" screws.

( ) Mount a prepared rocker switch at EF with two 4-40 x 1/4" screws.

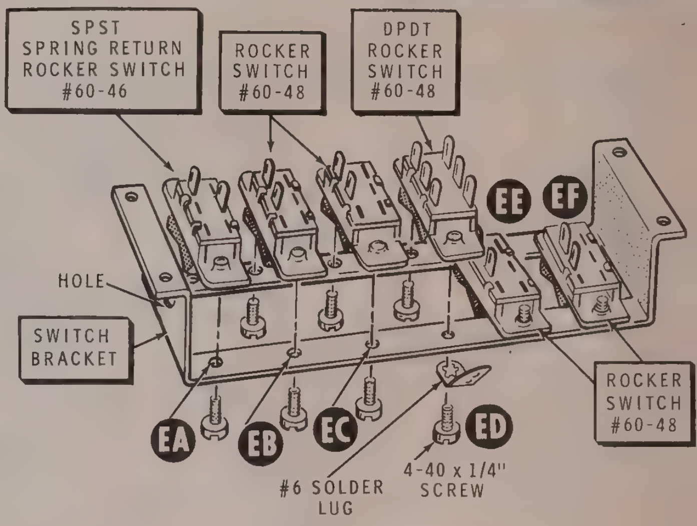
( ) Position the switch bracket and the chassis subassembly as shown in the Pictorial.

( ) Prepare a 3" length of white hookup wire by removing 1/4" of insulation from one end and 3/4" from the other end.

NOTE: When a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the soldering instructions (S-2), one entering and one leaving the connection.

( ) Insert the end with 3/4" insulation removed through lug 2 of switch EC (S-2) to lug 2 of switch ED (S-1). Connect the other end to lug 2 of switch EA (NS).

( ) Cut each lead of the 1000 Ω (brown-black-red) resistor to 1/2". Connect the resistor from lug 2 of switch EA (NS) to lug 2 of switch EB (NS).



Detail 6-11A

( ) Cut the positive lead of a 50 μF electrolytic capacitor to 3/4" and the other lead to 1-1/4".

( ) Remove a 1" length and a 1/2" length of insulation from the white hookup wire. Place the 1" length of insulation on the 1-1/4" capacitor lead. Place the 1/2" length of insulation on the 3/4" positive lead.

( ) Connect the 3/4" positive capacitor lead to lug 2 of switch EB (S-2). Connect the 1-1/4" lead to the #6 solder lug at ED (NS).

( ) Prepare a 6" length of white hookup wire and connect one end to lug 1 of switch EA (S-1). The other end will be connected later.

Connect the following wires from BO #5 of the wire harness to the switches:

( ) Gray wire to lug 2 of switch EA (S-3).

( ) Brown wire to lug 1 of switch EB (S-1).

( ) Black wire to lug 1 of switch EC (S-1).

( ) Orange wire to lug 3 of switch ED (S-1).

Locate the gray shielded cable coming from BO #5 of the chassis subassembly wire harness. This cable has a red lead, a black lead, a white lead, and an outer bare lead. Connect the leads of the cable as follows:

( ) White lead to lug 4 of switch ED (S-1).

( ) Red lead to lug 5 of switch ED (S-1).

3/4
1/2
1/4
0
1"
2"
3"
4"
5"
6"

(✓) Black lead to lug 6 of switch ED (S-1).

(✓) Outer bare lead to the solder lug at ED (NS).

Locate the two black shielded cables from BO #5 and connect them as follows:

(✓) Inner lead from either black cable to lug 1 of switch EE (S-1).

(✓) Inner lead from other black cable to lug 2 of switch EE (S-1).

(✓) Connect the outer bare leads from both cables to the solder lug at ED (S-4).

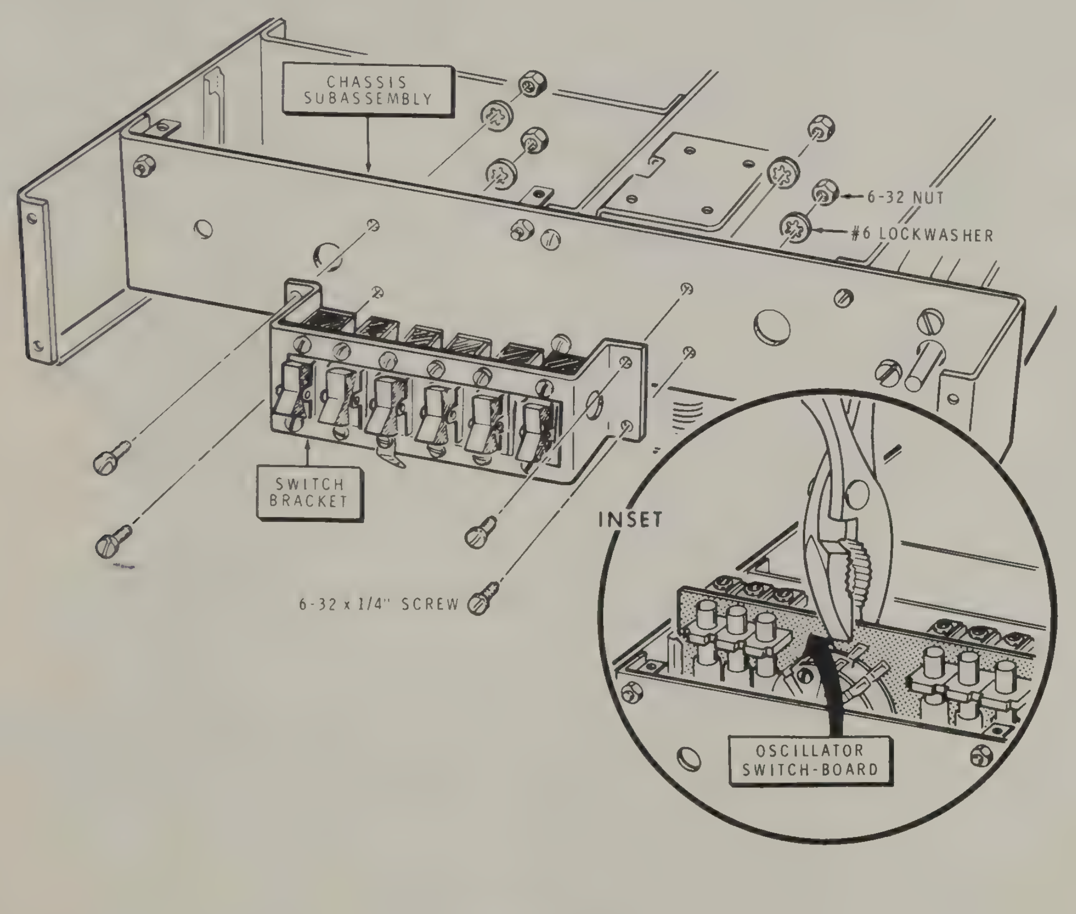
(✓) Either white wire to lug 1 of switch EF (S-1).

(✓) Other white wire to lug 2 of switch EF (S-1).

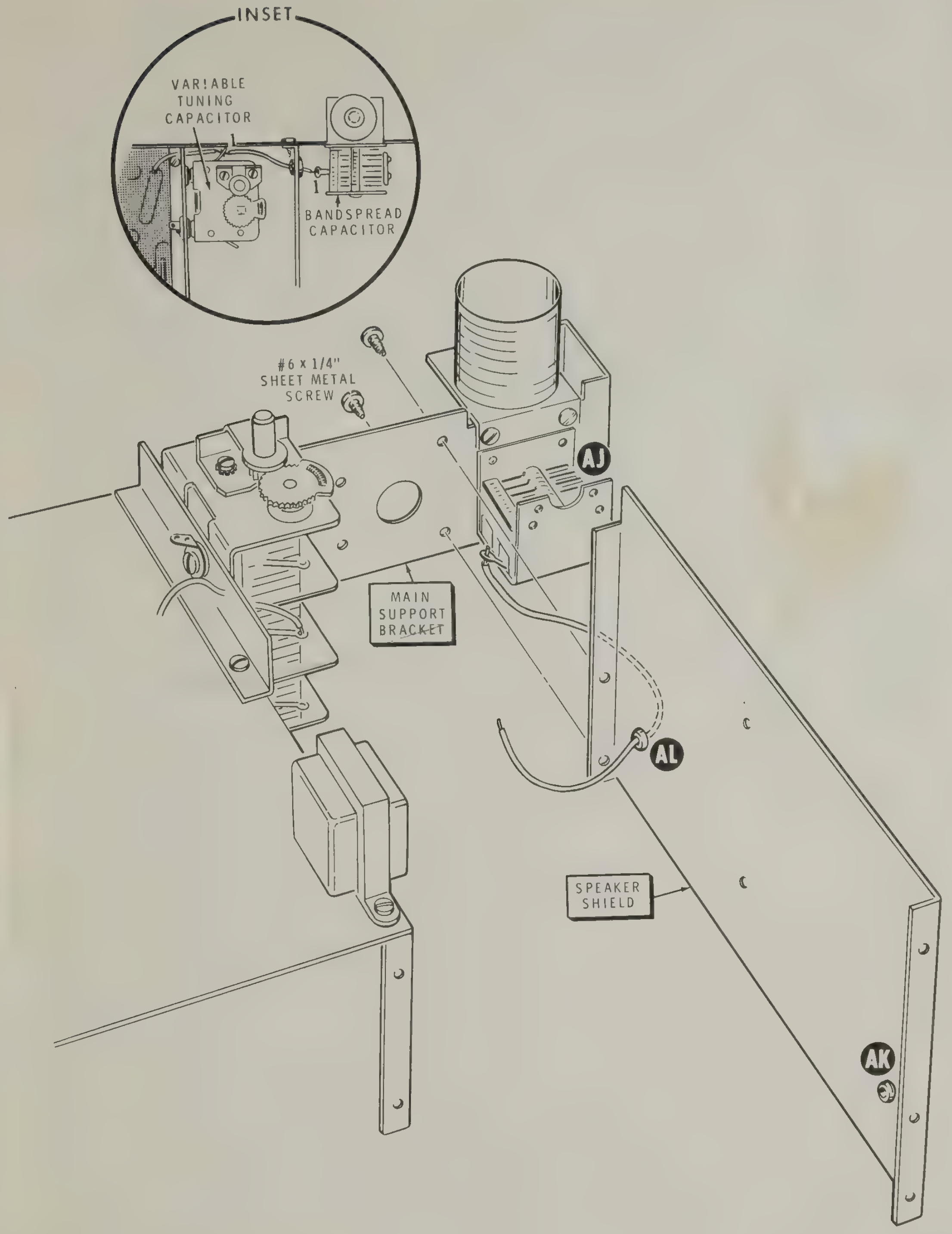
NOTE: It will be necessary to remove the OSCillator Switch-Board (#85-279-13) from the chassis before performing the next step. Remove the Switch-Board by carefully pulling on it with pliers as shown in the inset drawing and Detail 6-11B.

(✓) Refer to Detail 6-11B and turn the chassis subassembly over as shown. Then mount the switch bracket to the chassis subassembly with 6-32 x 1/4" hardware.

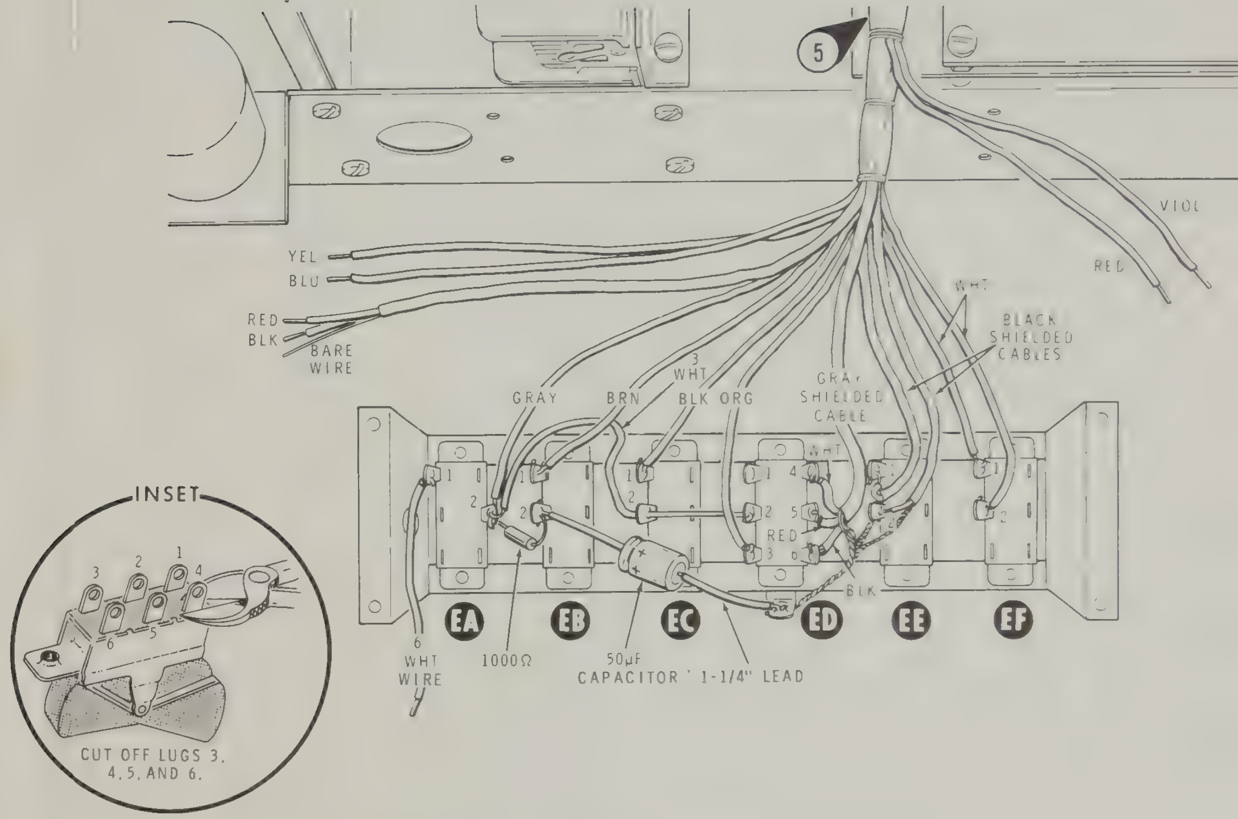
( ) Replace the oscillator Switch-Board in the chassis.


CHASSIS SUBASSEMBLY
6-32 NUT
#6 LOCKWASHER
SWITCH BRACKET
6-32 x 1/4" SCREW
INSET
OSCILLATOR SWITCH-BOARD

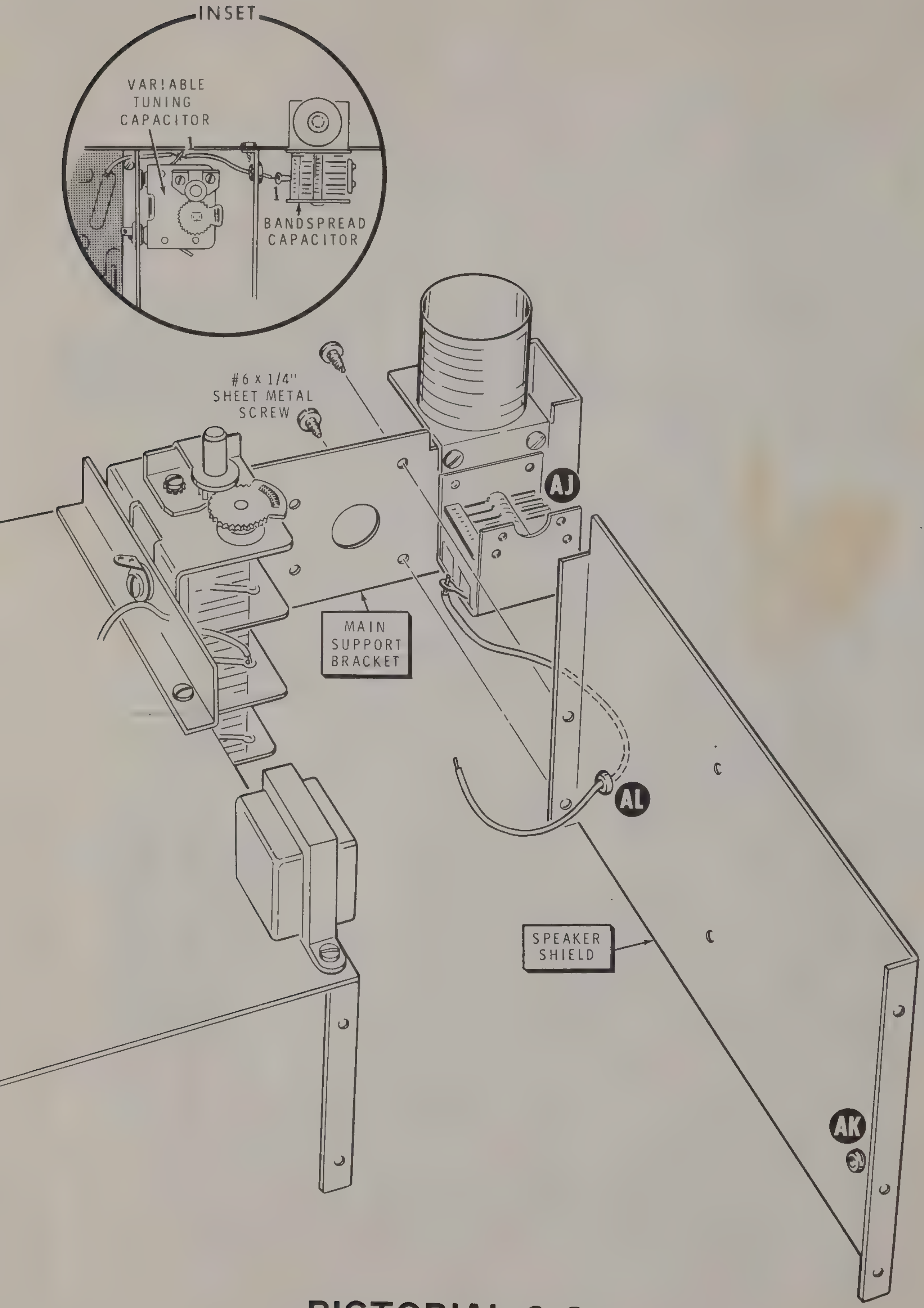
Detail 6-11B


INSET
VARIABLE TUNING CAPACITOR
BANDSPREAD CAPACITOR
#6 x 1/4" SHEET METAL SCREW
MAIN SUPPORT BRACKET
AJ
AL
AK
SPEAKER SHIELD

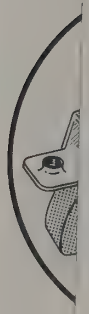
PICTORIAL 6-9


5
VIOL
RED
YEL
BLU
RED
BLK
BARE WIRE
WHT
BLACK SHIELDED CABLES
3
WHT
GRAY
BRN
BLK ORG
GRAY SHIELDED CABLE
WHT
1
2
4
5
3
6
RED
BLK
EA
EB
EC
ED
EE
EF
6
WHT WIRE
1000Ω
50μF CAPACITOR
1-1/4" LEAD
INSET
CUT OFF LUGS 3, 4, 5, AND 6.

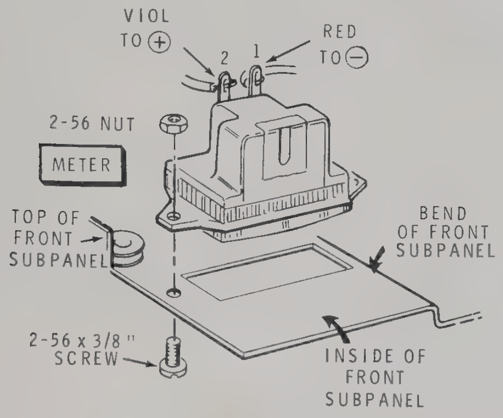
PICTORIAL 6-11


INSET
VARIABLE TUNING CAPACITOR
1
1
BANDSPREAD CAPACITOR
#6 x 1/4" SHEET METAL SCREW
AJ
MAIN SUPPORT BRACKET
AL
SPEAKER SHIELD
AK

PICTORIAL 6-9

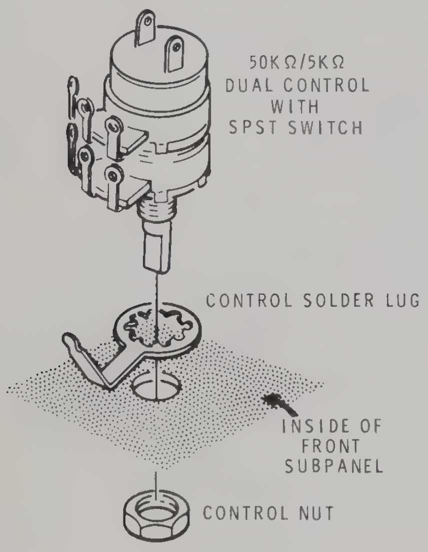


( ) Refer to Detail 6-12C and mount the meter at EP with a 2-56 x 3/8" screw and a 2-56 nut. Position the + (positive) sign as shown. Do not overtighten the screw, as the plastic meter case can be broken. (If necessary, bend the meter lugs as shown.)


VIOL
TO ⊕
2
1
RED
TO ⊖
2-56 NUT
METER
TOP OF FRONT SUBPANEL
BEND OF FRONT SUBPANEL
2-56 x 3/8" SCREW
INSIDE OF FRONT SUBPANEL

Detail 6-12C

( ) Refer to Detail 6-12D and mount the 50 kΩ and 5 kΩ dual control with SPST switch (#14-7) at ER with a control solder lug and a control nut. Tighten the nut only finger tight, as the nut will be removed later for front panel installation.


50KΩ/5KΩ DUAL CONTROL WITH SPST SWITCH
CONTROL SOLDER LUG
INSIDE OF FRONT SUBPANEL
CONTROL NUT

Detail 6-12D

( ) Position the front subpanel near the chassis subassembly as shown in the Pictorial.

( ) Connect the 6" white wire coming from lug 1 of switch EA to lug 3 of terminal strip EJ (S-2).

( ) Connect a 1" length of bare wire from lug 2 (S-1), through lug 3 (NS) of control ER, to the control solder lug (S-1).

( ) Prepare a 1-1/2" length of white hookup wire.

( ) Connect this wire between lug 8 (S-1) and lug 6 (NS) of control ER.

Locate the black shielded cable (coming from the wire harness) that has a red lead, black lead, and a bare lead. Connect the leads of this cable as follows:

( ) Black lead to lug 4 of control ER (NS).

( ) Red lead to lug 5 of control ER (S-1).

( ) Bare lead through lug 6 (NS) to lug 3 (S-3) of control ER.

( ) Connect the blue wire coming from the wire harness to lug 7 of control ER (S-1).

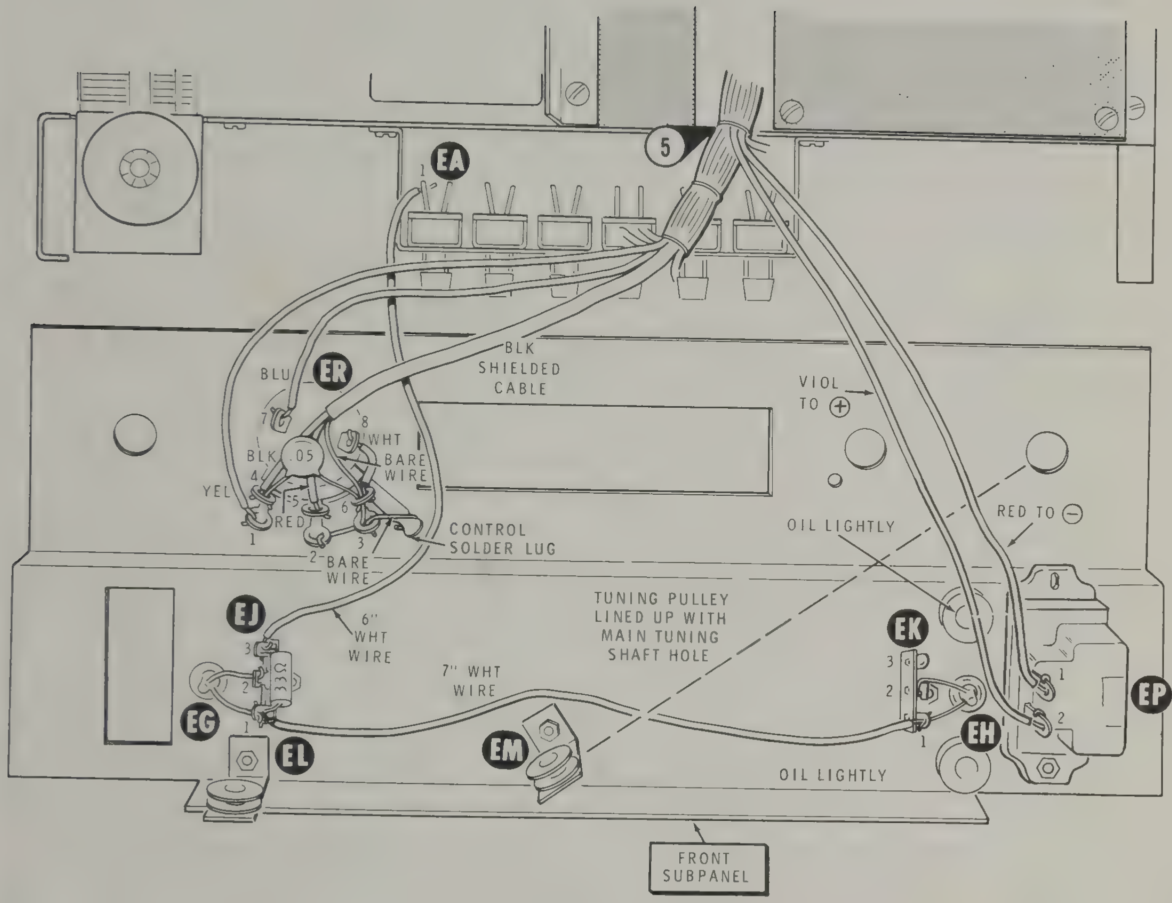
( ) Connect the yellow wire coming from the wire harness to lug 1 of control ER (S-1).

( ) Connect a .05 μF disc capacitor between lugs 4 (S-2) and 6 (S-4) of control ER.

( ) Connect the violet wire coming from the wire harness to lug 2 of meter EP (S-1).

( ) Connect the red wire coming from the wire harness to lug 1 of meter EP (S-1).

(✓) Apply a very small amount of oil to the two pulleys nearest the meter. CAUTION: Be very careful not to get oil in the pulley grooves.


5
EA
1
BLU
ER
7
8
BLK
SHIELDED
CABLE
WHT
BLK
.05
BARE
WIRE
4
YEL
5
6
RED
1
2
3
CONTROL
SOLDER LUG
BARE
WIRE
VIOL
TO ⊕
RED TO ⊖
OIL LIGHTLY
EJ
6"
WHT
WIRE
TUNING PULLEY
LINED UP WITH
MAIN TUNING
SHAFT HOLE
7" WHT
WIRE
33Ω
EG
EL
EM
EK
EH
EP
OIL LIGHTLY
FRONT
SUBPANEL

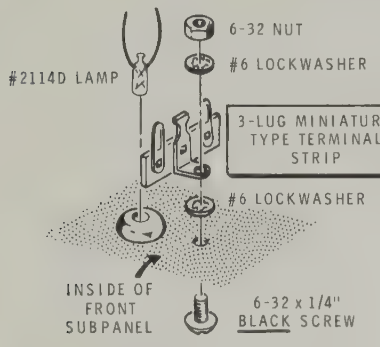
PICTORIAL 6-12

Refer to Pictorial 6-12 (fold-out from this page) for the following steps.

( ) Locate the front subpanel and position it as shown on a soft cloth.

( ) Install 5/16" rubber grommets at EG and EH.

( ) Refer to Detail 6-12A and mount a 3-lug miniature terminal strip at EJ and EK with 6-32 x 1/4" black screws and #6 hardware.


6-32 NUT
#6 LOCKWASHER
#2114D LAMP
3-LUG MINIATURE TYPE TERMINAL STRIP
#6 LOCKWASHER
INSIDE OF FRONT SUBPANEL
6-32 x 1/4" BLACK SCREW

Detail 6-12A

( ) Bend terminal strip EK as shown in the Pictorial. Be careful when bending so as not to break the mounting foot.

( ) Push a #2114D lamp into grommet EG as shown in Detail 6-12A so the lamp extends 1/16" through the grommet. CAUTION: The lamp breaks quite easily.

NOTE: When installing the small pilot lamp, do not shorten the leads. Wrap the entire lead length around the terminal strip lug to be sure of a good connection.

( ) Connect one lead of this lamp to lug 2 (S-1) and the other lead to lug 1 (NS) of terminal strip EJ.

( ) Connect a 33 Ω (orange-orange-black) resistor between lug 1 (NS) and lug 3 (NS) of terminal strip EJ.

( ) In the same manner, push the remaining #2114D lamp into grommet EH as shown in Detail 6-12A.

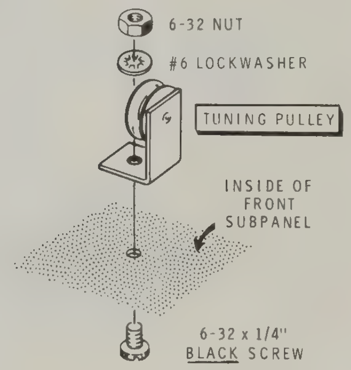
( ) Connect one lead of this lamp to lug 2 (S-1) and the other lead to lug 1 (NS) of terminal strip EK.

( ) Prepare a 7" length of white hookup wire.

( ) Connect one end of the 7" wire to lug 1 of terminal strip EJ (S-3).

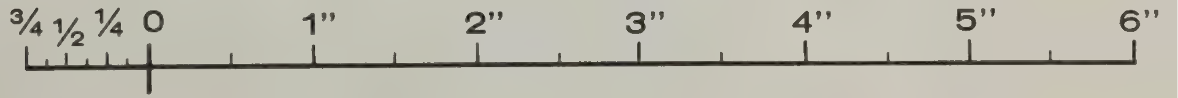
( ) Connect the other end of this wire to lug 1 of terminal strip EK (S-2). Position the wire as shown in the Pictorial.

( ) Refer to Detail 6-12B and mount a tuning pulley at EL with a 6-32 x 1/4" black screw and #6 hardware. Position the pulley as shown in the Pictorial.

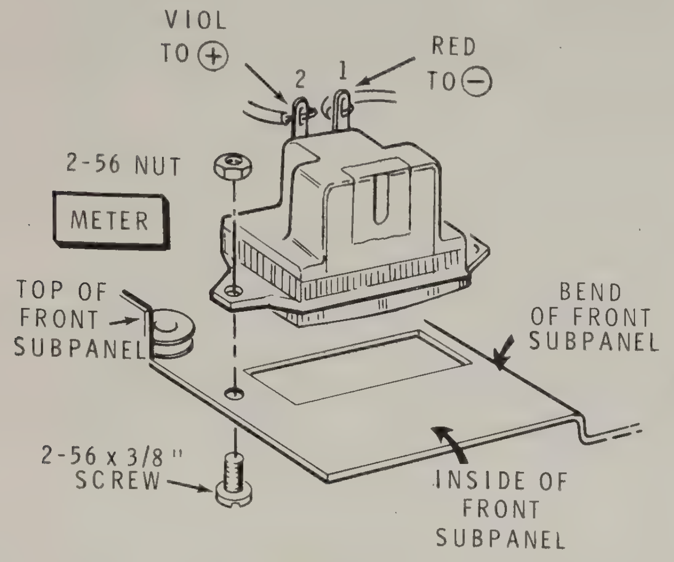

6-32 NUT
#6 LOCKWASHER
TUNING PULLEY
INSIDE OF FRONT SUBPANEL
6-32 x 1/4" BLACK SCREW

Detail 6-12B

( ) Mount the remaining tuning pulley at EM with a 6-32 x 1/4" black screw and #6 hardware. Position this pulley so it points along the dotted line toward the indicated hole as shown.

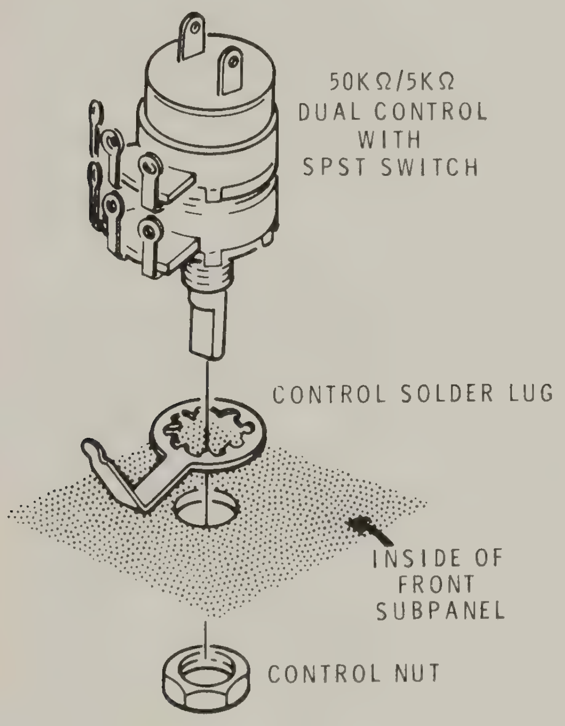

¾
½
¼
0
1"
2"
3"
4"
5"
6"

( ) Refer to Detail 6-12C and mount the meter at EP with a 2-56 x 3/8" screw and a 2-56 nut. Position the + (positive) sign as shown. Do not overtighten the screw, as the plastic meter case can be broken. (If necessary, bend the meter lugs as shown.)


VIOL TO ⊕
2
1
RED TO ⊖
2-56 NUT
METER
TOP OF FRONT SUBPANEL
BEND OF FRONT SUBPANEL
2-56 x 3/8" SCREW
INSIDE OF FRONT SUBPANEL

Detail 6-12C

( ) Refer to Detail 6-12D and mount the 50 kΩ and 5 kΩ dual control with SPST switch (#14-7) at ER with a control solder lug and a control nut. Tighten the nut only finger tight, as the nut will be removed later for front panel installation.


50KΩ/5KΩ DUAL CONTROL WITH SPST SWITCH
CONTROL SOLDER LUG
INSIDE OF FRONT SUBPANEL
CONTROL NUT

Detail 6-12D

( ) Position the front subpanel near the chassis subassembly as shown in the Pictorial.

( ) Connect the 6" white wire coming from lug 1 of switch EA to lug 3 of terminal strip EJ (S-2).

( ) Connect a 1" length of bare wire from lug 2 (S-1), through lug 3 (NS) of control ER, to the control solder lug (S-1).

( ) Prepare a 1-1/2" length of white hookup wire.

( ) Connect this wire between lug 8 (S-1) and lug 6 (NS) of control ER.

Locate the black shielded cable (coming from the wire harness) that has a red lead, black lead, and a bare lead. Connect the leads of this cable as follows:

( ) Black lead to lug 4 of control ER (NS).

( ) Red lead to lug 5 of control ER (S-1).

( ) Bare lead through lug 6 (NS) to lug 3 (S-3) of control ER.

( ) Connect the blue wire coming from the wire harness to lug 7 of control ER (S-1).

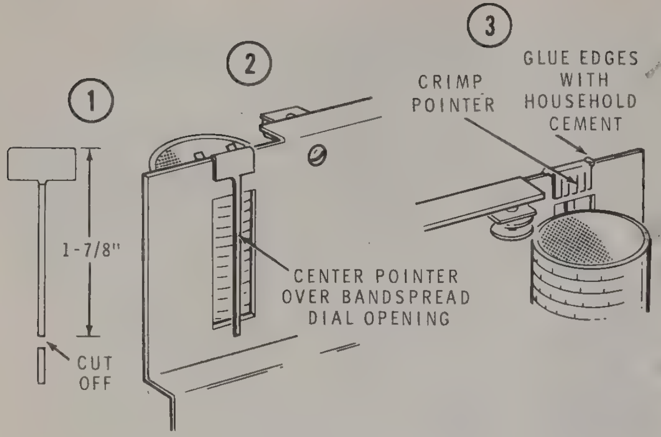
( ) Connect the yellow wire coming from the wire harness to lug 1 of control ER (S-1).

( ) Connect a .05 µF disc capacitor between lugs 4 (S-2) and 6 (S-4) of control ER.

( ) Connect the violet wire coming from the wire harness to lug 2 of meter EP (S-1).

( ) Connect the red wire coming from the wire harness to lug 1 of meter EP (S-1).

(✓) Apply a very small amount of oil to the two pulleys nearest the meter. CAUTION: Be very careful not to get oil in the pulley grooves.


③
GLUE EDGES WITH HOUSEHOLD CEMENT
CRIMP POINTER
②
①
1-7/8"
CENTER POINTER OVER BANDSPREAD DIAL OPENING
CUT OFF

Detail 6-13A

Refer to Pictorial 6-13 (fold-out from Page 63) for the following steps.

( ) Mount the front subpanel to the chassis subassembly with four #6 x 1/4" sheet metal screws.

( ) Remove the control nut holding control ER to the front subpanel. Do not push the control shaft back through the front subpanel after removing the nut. Temporarily set the nut aside until it is called for in a later step.

( ) Refer to Detail 6-13A and cut off the bandspread dial pointer as shown. Then install and center the pointer over the bandspread dial opening at FB. Crimp the top of the pointer as shown and then glue it to the front subpanel with household cement.

( ) Locate the plastic dial window and position it in front of the front subpanel. Make sure that the control shaft at ER is extending through the plastic dial window.

( ) Locate the front panel and carefully position it in front of the plastic dial window using the same procedure.

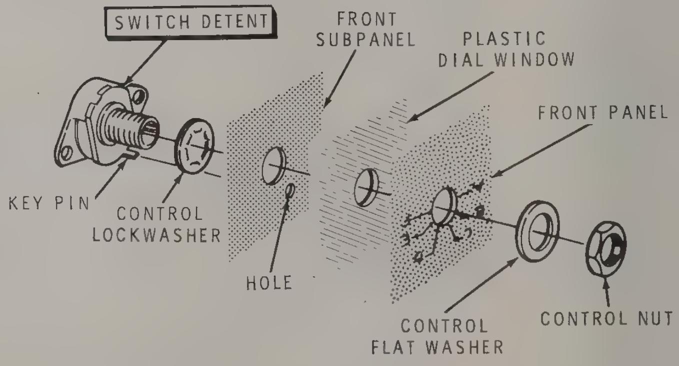
( ) Place a control flat washer and a control nut on control shaft ER. Tighten the nut finger tight.

( ) Install a 3/8" tuning bushing and a control flat washer through the front panel, dial window, and front subpanel at FC. Secure it with a control lockwasher and a control nut, as shown in the Pictorial. Tighten the nut finger tight.

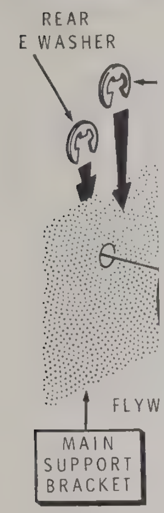
( ) Position the chassis upside down on your work area.

( ) Refer to Detail 6-13B and mount the switch detent at FD with a control lockwasher, a control flat washer, and a control nut. Make sure the key pin of the switch detent is positioned in the hole in the front subpanel. Tighten the nut finger tight.

( ) Position the plastic dial window and the front panel so the six rocker switches and the six scales on the plastic dial window are lined up and parallel with openings in the front panel. Then tighten the control nuts and front tuning bushings. Do not tighten the band switch detent control nut. NOTE: After tightening the hardware, operate each rocker switch to be sure it moves freely. It may be necessary to loosen the hardware and realign the front panel.


SWITCH DETENT
FRONT SUBPANEL
PLASTIC DIAL WINDOW
FRONT PANEL
KEY PIN
CONTROL LOCKWASHER
HOLE
CONTROL FLAT WASHER
CONTROL NUT

Detail 6-13B

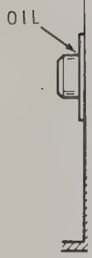

REAR
E WASHER
FLYW
MAIN
SUPPORT
BRACKET

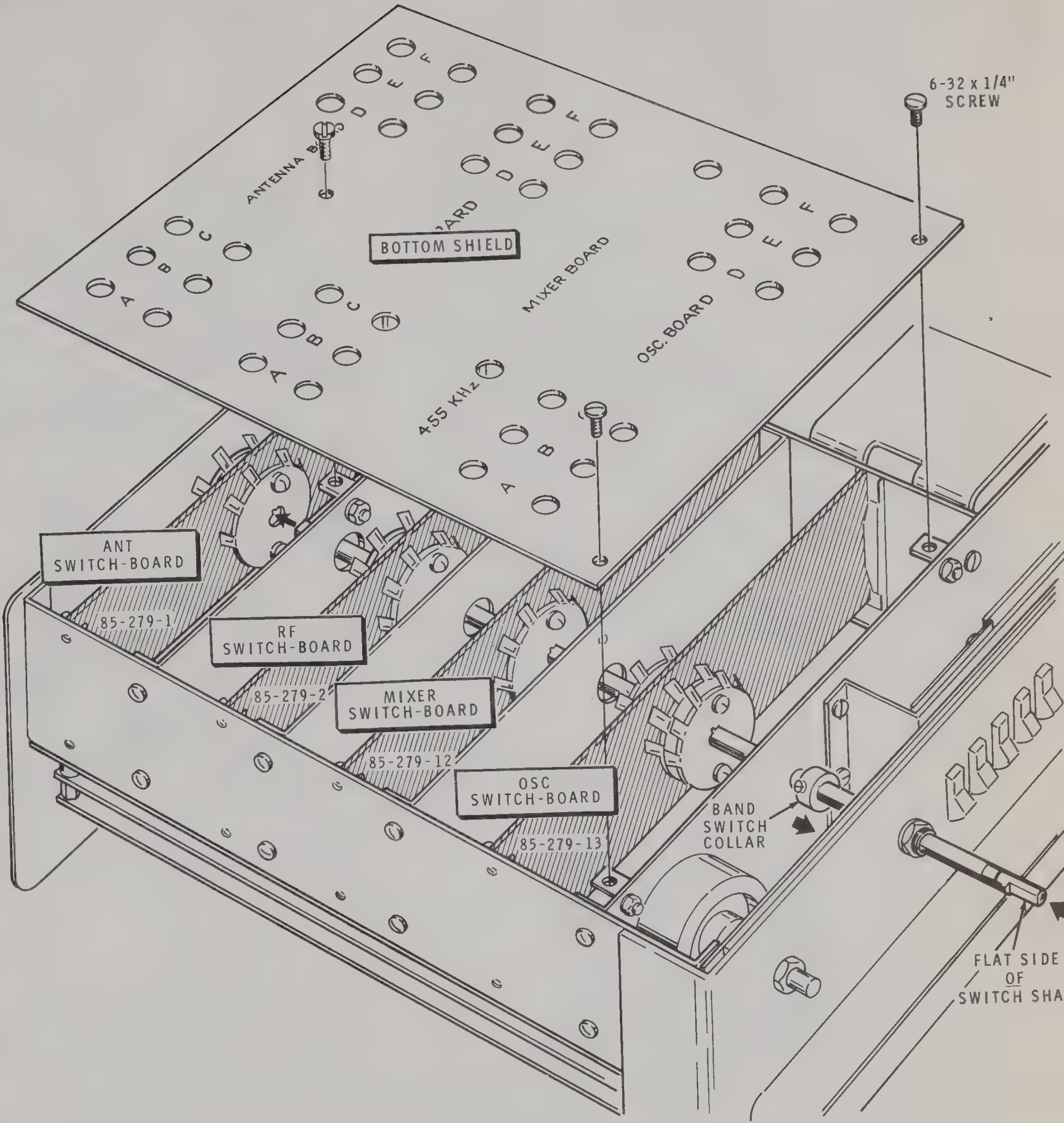
Refer to Detail

( ) Start two
do not tig

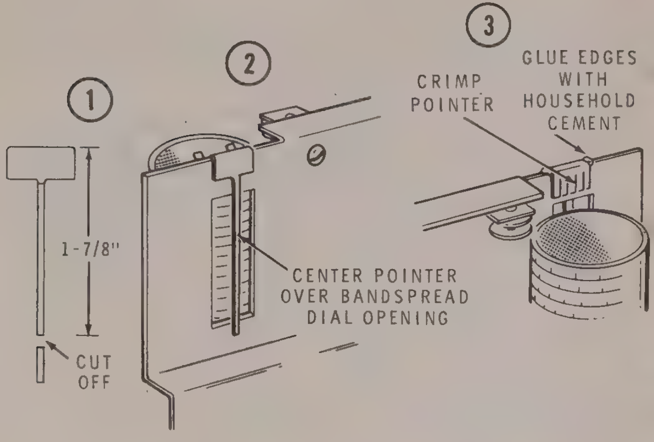
~~( ) Insert the~~
FC, just
with the s

( ) Clip the
in the tun




6-32 x 1/4"
SCREW
BOTTOM SHIELD
ANTENNA B
ARD
MIXER BOARD
OSC. BOARD
455 KHz
A
B
C
D
E
F
ANT
SWITCH-BOARD
85-279-1
RF
SWITCH-BOARD
85-279-2
MIXER
SWITCH-BOARD
85-279-12
OSC
SWITCH-BOARD
85-279-13
BAND
SWITCH
COLLAR
FLAT SIDE
OF
SWITCH SHA

PICTORIAL 6-15


1
2
3
1-7/8"
CUT OFF
CENTER POINTER OVER BANDSPREAD DIAL OPENING
CRIMP POINTER
GLUE EDGES WITH HOUSEHOLD CEMENT

Detail 6-13A

Refer to Pictorial 6-13 (fold-out from Page 63) for the following steps.

( ) Mount the front subpanel to the chassis subassembly with four #6 x 1/4" sheet metal screws.

( ) Remove the control nut holding control ER to the front subpanel. Do not push the control shaft back through the front subpanel after removing the nut. Temporarily set the nut aside until it is called for in a later step.

( ) Refer to Detail 6-13A and cut off the bandspread dial pointer as shown. Then install and center the pointer over the bandspread dial opening at FB. Crimp the top of the pointer as shown and then glue it to the front subpanel with household cement.

( ) Locate the plastic dial window and position it in front of the front subpanel. Make sure that the control shaft at ER is extending through the plastic dial window.

( ) Locate the front panel and carefully position it in front of the plastic dial window using the same procedure.

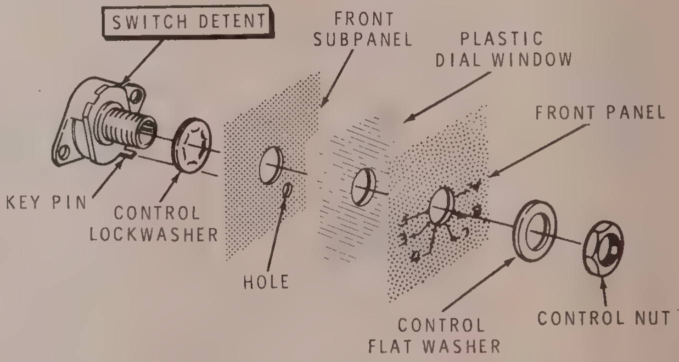
( ) Place a control flat washer and a control nut on control shaft ER. Tighten the nut finger tight.

( ) Install a 3/8" tuning bushing and a control flat washer through the front panel, dial window, and front subpanel at FC. Secure it with a control lockwasher and a control nut, as shown in the Pictorial. Tighten the nut finger tight.

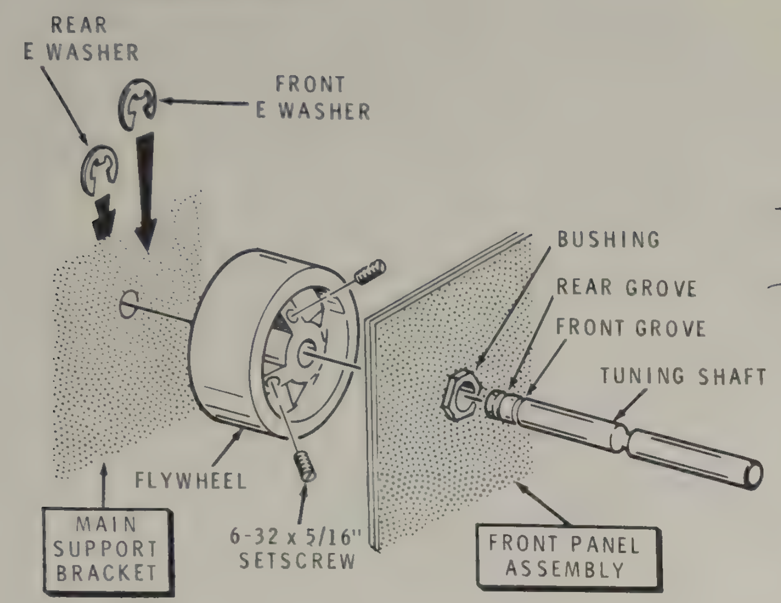
( ) Position the chassis upside down on your work area.

( ) Refer to Detail 6-13B and mount the switch detent at FD with a control lockwasher, a control flat washer, and a control nut. Make sure the key pin of the switch detent is positioned in the hole in the front subpanel. Tighten the nut finger tight.

( ) Position the plastic dial window and the front panel so the six rocker switches and the six scales on the plastic dial window are lined up and parallel with openings in the front panel. Then tighten the control nuts and front tuning bushings. Do not tighten the band switch detent control nut. NOTE: After tightening the hardware, operate each rocker switch to be sure it moves freely. It may be necessary to loosen the hardware and realign the front panel.


SWITCH DETENT
FRONT SUBPANEL
PLASTIC DIAL WINDOW
FRONT PANEL
KEY PIN
CONTROL LOCKWASHER
HOLE
CONTROL FLAT WASHER
CONTROL NUT

Detail 6-13B


REAR E WASHER
FRONT E WASHER
BUSHING
REAR GROVE
FRONT GROVE
TUNING SHAFT
FLYWHEEL
MAIN SUPPORT BRACKET
6-32 x 5/16" SETSCREW
FRONT PANEL ASSEMBLY

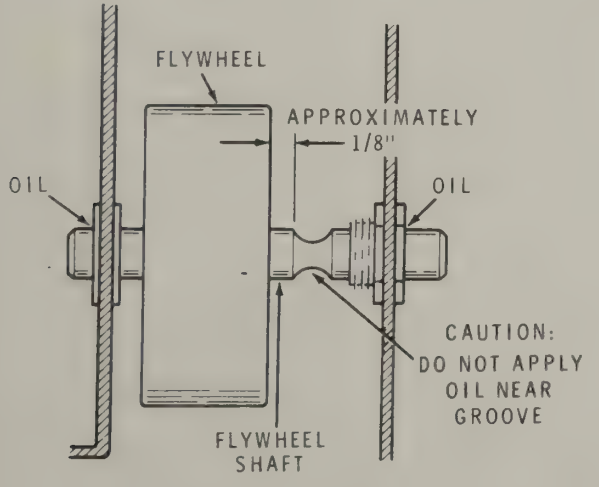
Detail 6-13C

Refer to Detail 6-13C for the following steps.

( ) Start two 6-32 x 5/16" setscrews in the flywheel, but do not tighten them.

( ) Insert the tuning shaft through the tuning bushing at FC, just far enough to place the flywheel on the shaft with the setscrews as shown.

( ) Clip the front E washer into place in the front groove in the tuning shaft.


FLYWHEEL
APPROXIMATELY 1/8"
OIL
OIL
CAUTION: DO NOT APPLY OIL NEAR GROOVE
FLYWHEEL SHAFT

Detail 6-13D

( ) Push the tuning shaft through the hole in the main support bracket and then clip the rear E washer into place in the rear groove in the shaft.

( ) Position the flywheel on the shaft as shown in Detail 6-13D and tighten both setscrews.

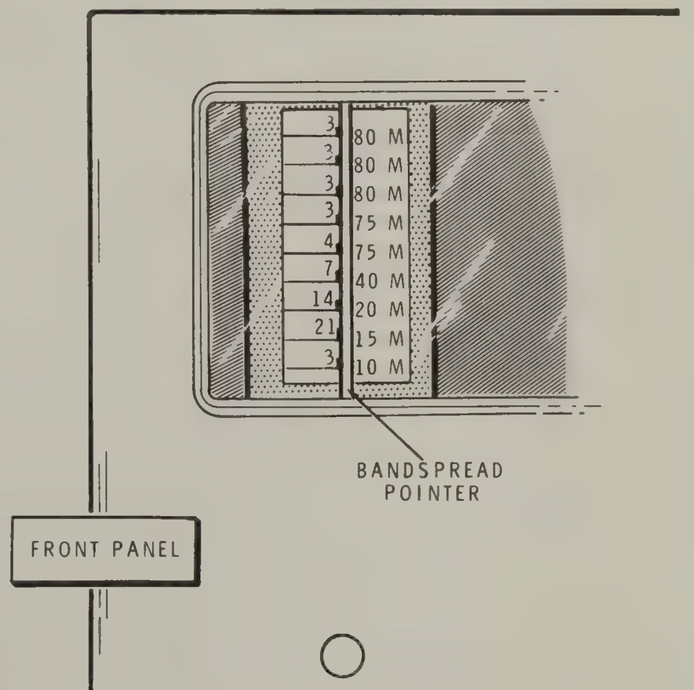
( ) Apply a drop of oil on the flywheel shaft at the E washer and as shown in Detail 6-13D.

( ) Loosen the 4-40 x 1/8" setscrew holding the nylon gear on the bandspread capacitor shaft.

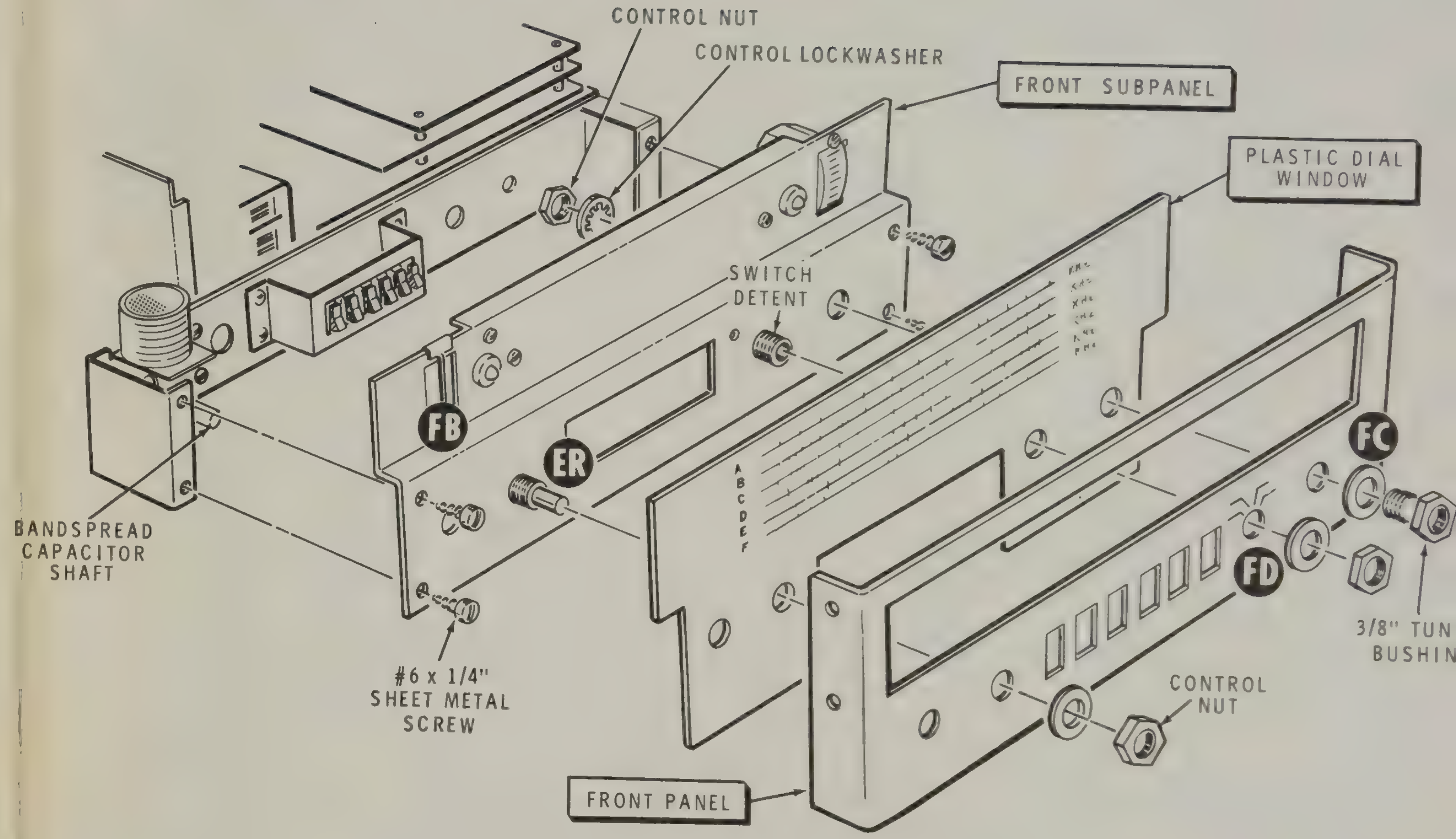
( ) Rotate the bandspread capacitor shaft fully counterclockwise.

( ) Refer to Detail 6-13E and rotate the bandspread dial drum with your fingers until it is positioned behind the bandspread pointer as shown.

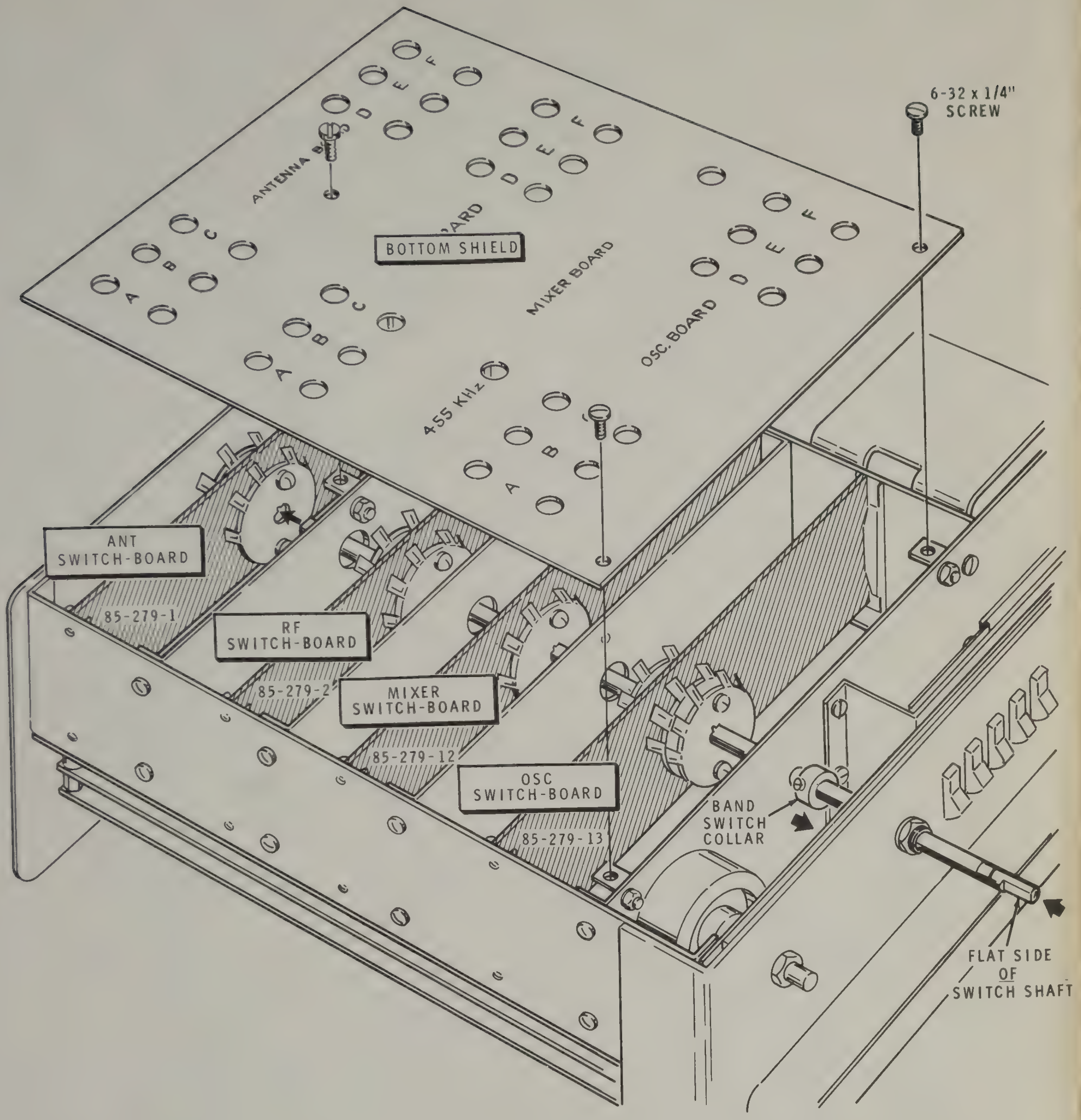
( ) Hold the bandspread dial drum in position and tighten the 4-40 x 1/8" setscrew holding the nylon gear on the bandspread capacitor shaft. Do not overtighten the setscrew.


3
3
3
3
4
7
14
21
3
80 M
80 M
80 M
75 M
75 M
40 M
20 M
15 M
10 M
BANDSPREAD POINTER
FRONT PANEL

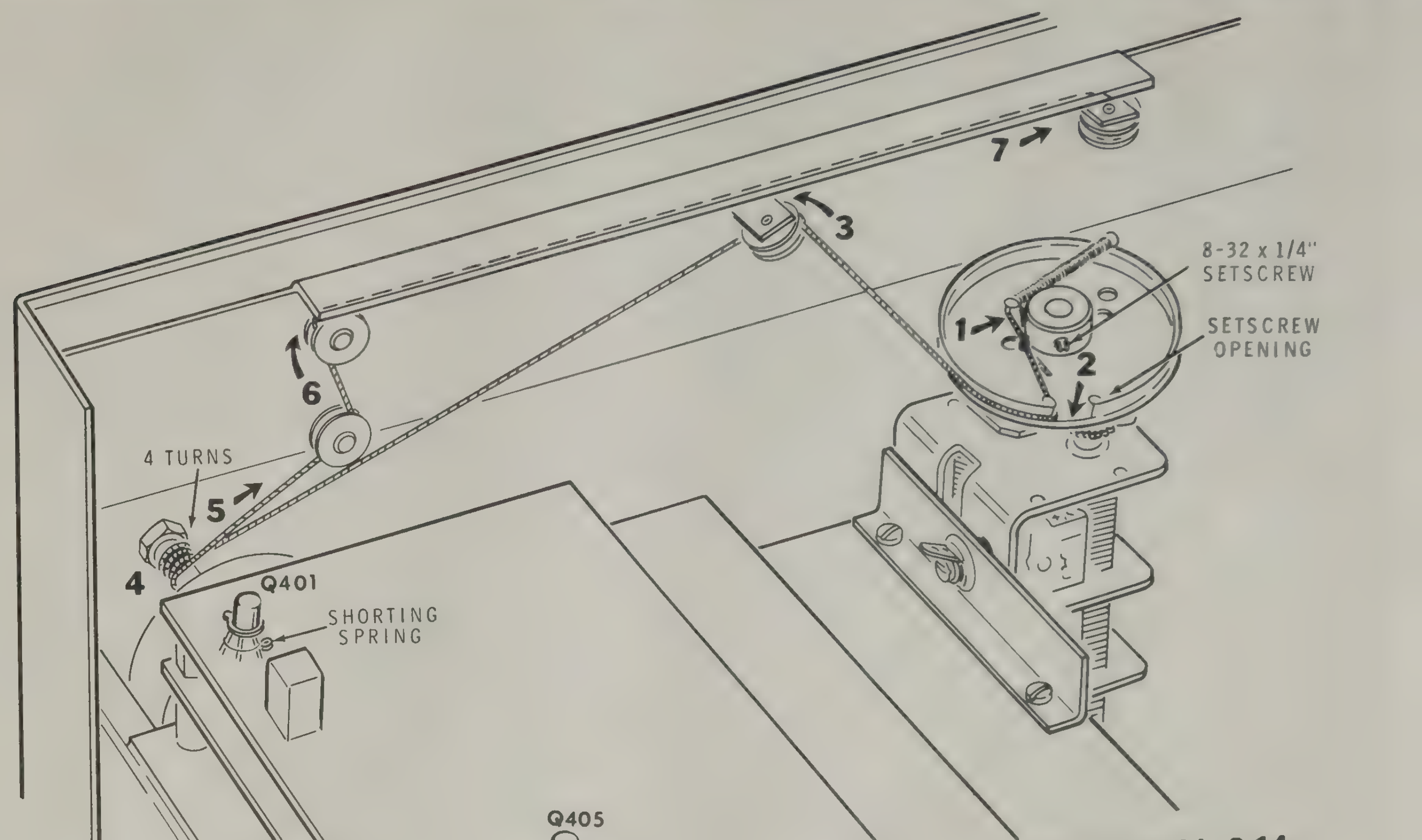
Detail 6-13E


CONTROL NUT
CONTROL LOCKWASHER
FRONT SUBPANEL
PLASTIC DIAL WINDOW
SWITCH DETENT
FB
ER
FC
FD
BANDSPREAD CAPACITOR SHAFT
#6 x 1/4" SHEET METAL SCREW
3/8" TUN BUSHIN
CONTROL NUT
FRONT PANEL

PICTORIAL 6-13


6-32 x 1/4" SCREW
ANTENNA BOARD
BOTTOM SHIELD
MIXER BOARD
OSC. BOARD
455 KHz
A
B
C
D
E
F
ANT SWITCH-BOARD
85-279-1
RF SWITCH-BOARD
85-279-2
MIXER SWITCH-BOARD
85-279-12
OSC SWITCH-BOARD
85-279-13
BAND SWITCH COLLAR
FLAT SIDE OF SWITCH SHAFT

PICTORIAL 6-15


7
3
8-32 x 1/4" SETSCREW
1
2
SETSCREW OPENING
6
4 TURNS
5
4
Q401
SHORTING SPRING
Q405

PICTORIAL 6-14

Refer to Pictorial 6-14 for the following steps.

( ) Position the chassis as shown.

( ) Start an 8-32 x 1/4" setscrew in the capacitor pulley, but do not tighten it.

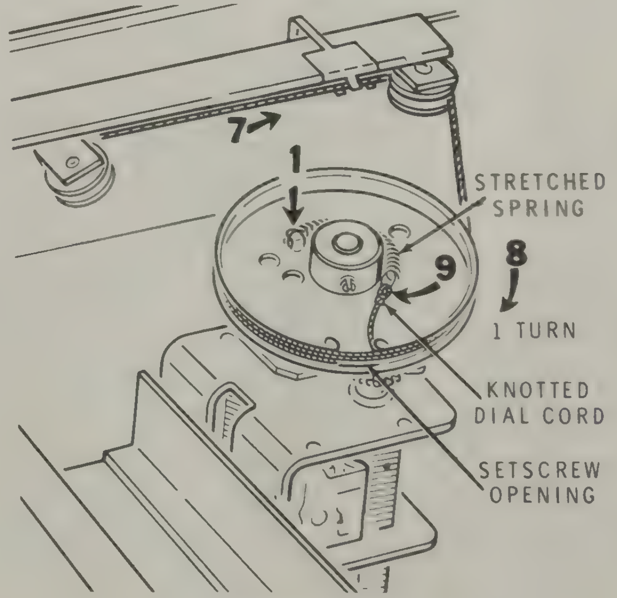
( ) Make sure the capacitor plates are fully closed. Then mount the capacitor pulley on the capacitor shaft with the setscrew opening as shown in the Pictorial.

( ) Tie a loop into one end of the dial cord. Then place the loop over the hook on the capacitor pulley at 1.

( ) Clip one end of the spring over the same hook on the capacitor pulley at 1.

( ) Loop the dial cord around the capacitor pulley at 2, around tuning pulley 3, around the tuning shaft four turns as shown at 4, around tuning pulley 5, and then around tuning pulleys at 6 and 7.

( ) Make sure the dial cord is over the pulleys and pulled taut. Then refer to Detail 6-14A and wrap the dial cord around the capacitor pulley one turn; place the end of the cord into the setscrew opening. Tie the dial cord to spring with a knot at 9. Make sure the spring is stretched around the center of the capacitor pulley as shown.

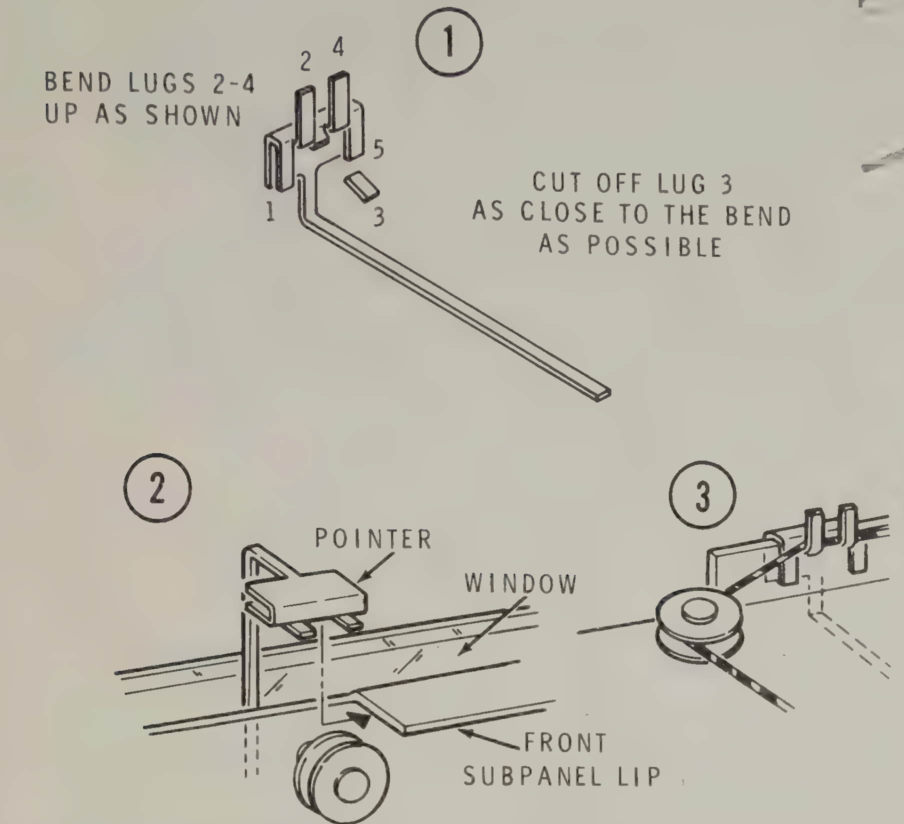

7
1
STRETCHED SPRING
8
9
1 TURN
KNOTTED DIAL CORD
SETSCREW OPENING

Detail 6-14A

( ) Refer to Part 1 of Detail 6-14B and cut off lug 3 of the pointer. Then bend lugs 2 and 4 up as shown.

( ) Install the pointer on the front subpanel lip as shown in Part 2 of Detail 6-14B.

( ) Position the dial cord over the pointer tabs as shown in Part 3 of Detail 6-14B. The pointer will be secured to the cord later.


①
BEND LUGS 2-4 UP AS SHOWN
2
4
5
1
3
CUT OFF LUG 3 AS CLOSE TO THE BEND AS POSSIBLE
②
POINTER
WINDOW
FRONT SUBPANEL LIP
③

INSERT THE POINTER BETWEEN THE FRONT SUBPANEL AND THE WINDOW IN THE POSITION SHOWN. THEN SLIDE THE POINTER ONTO THE FRONT SUBPANEL LIP.

POSITION THE DIAL CORD AROUND THE TWO PRONGS EXACTLY AS INDICATED. DO NOT BEND THE TWO PRONGS AGAINST THE DIAL CORD UNTIL INSTRUCTED TO DO SO.

Detail 6-14B

( ) Rotate the tuning shaft a few times to make sure the dial cord does not slip. If the dial cord does slip, untie the knot and pull the cord taut again.

( ) Using long-nose pliers, carefully pull the shorting springs from transistors Q401 and Q405 on the receiver circuit board.

Refer to Pictorial 6-15 (fold-out from Page 64) for the following steps.

( ) Position the chassis as shown in the Pictorial.

( ) Remove the RF and the mixer Switch-Boards from the chassis.

( ) Using long-nose pliers, carefully pull the shorting spring from the 40673 transistor on each of these Switch-Boards.

( ) Reinstall the Switch-Boards in the chassis.

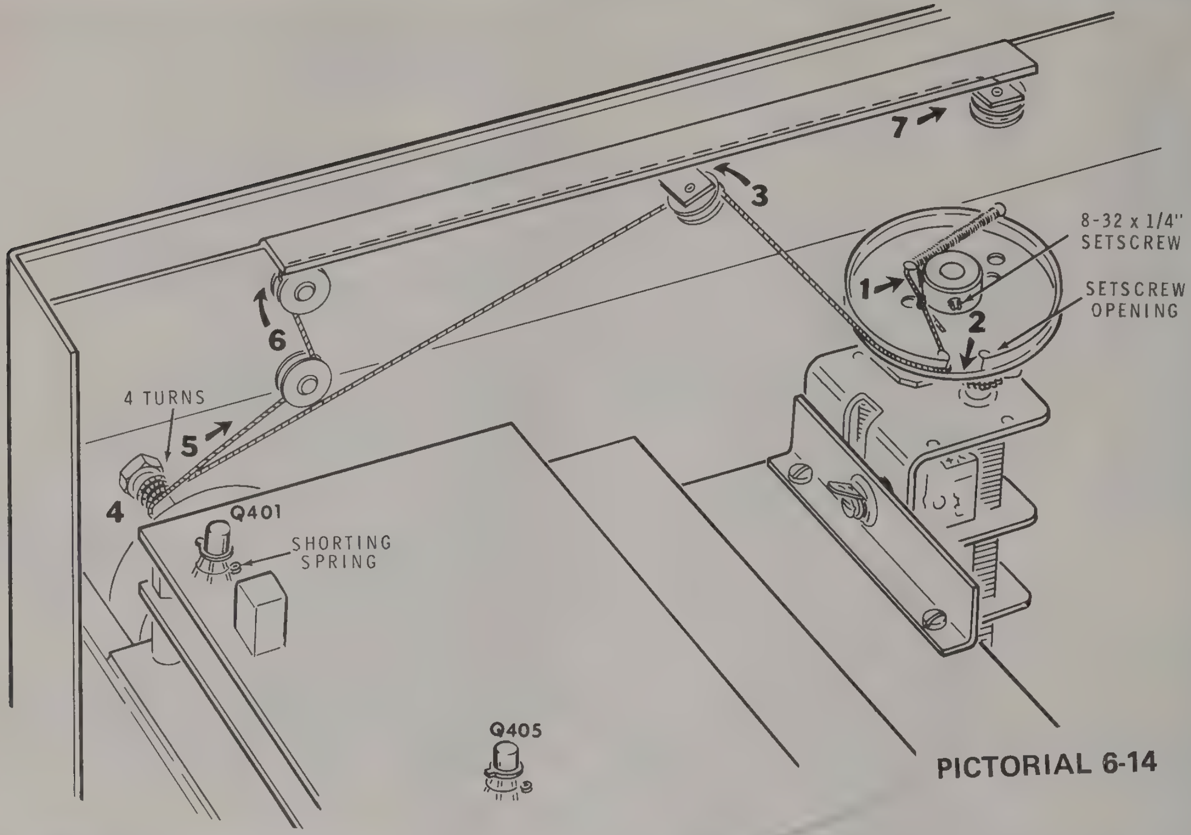
( ) Start an 8-32 x 1/4" setscrew into the bandswitch collar but do not tighten it.

( ) Position the flat side (knob end) of the bandswitch shaft as shown in the Pictorial. Then insert the shaft through the switch detent on the front panel. Slip the bandswitch collar over the end of the shaft with the setscrew positioned as shown. Using extreme care push the shaft through each wafer of the four switchboards. If the shaft stops at a wafer, rotate the shaft slightly in both directions until it goes through the wafer.

( ) Tighten the bandswitch detent control nut.

( ) After the shaft is inserted through each wafer, slide the bandswitch collar against the back of the detent switch and tighten the setscrew.

( ) Refer to the Pictorial and install the bottom shield with three 6-32 x 1/4" screws in the indicated holes.



7
3
8-32 x 1/4"
SETSCREW
1
2
SETSCREW
OPENING
6
4 TURNS
5
4
Q401
SHORTING
SPRING
Q405

PICTORIAL 6-14

Refer to Pictorial 6-14 for the following steps.

( ) Position the chassis as shown.

( ) Start an 8-32 x 1/4" setscrew in the capacitor pulley, but do not tighten it.

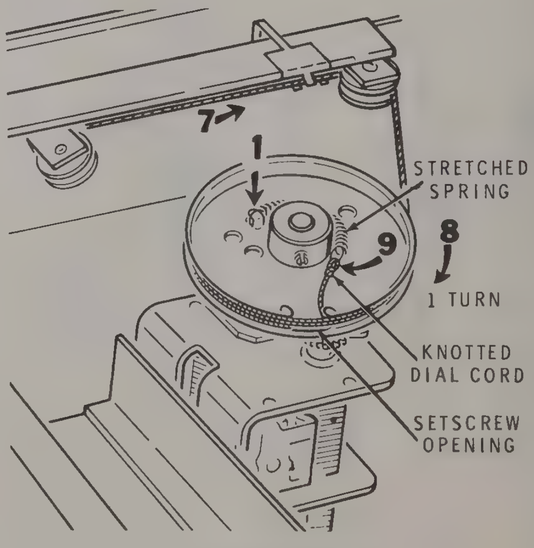
( ) Make sure the capacitor plates are fully closed. Then mount the capacitor pulley on the capacitor shaft with the setscrew opening as shown in the Pictorial.

( ) Tie a loop into one end of the dial cord. Then place the loop over the hook on the capacitor pulley at 1.

( ) Clip one end of the spring over the same hook on the capacitor pulley at 1.

( ) Loop the dial cord around the capacitor pulley at 2, around tuning pulley 3, around the tuning shaft four turns as shown at 4, around tuning pulley 5, and then around tuning pulleys at 6 and 7.

( ) Make sure the dial cord is over the pulleys and pulled taut. Then refer to Detail 6-14A and wrap the dial cord around the capacitor pulley one turn; place the end of the cord into the setscrew opening. Tie the dial cord to spring with a knot at 9. Make sure the spring is stretched around the center of the capacitor pulley as shown.



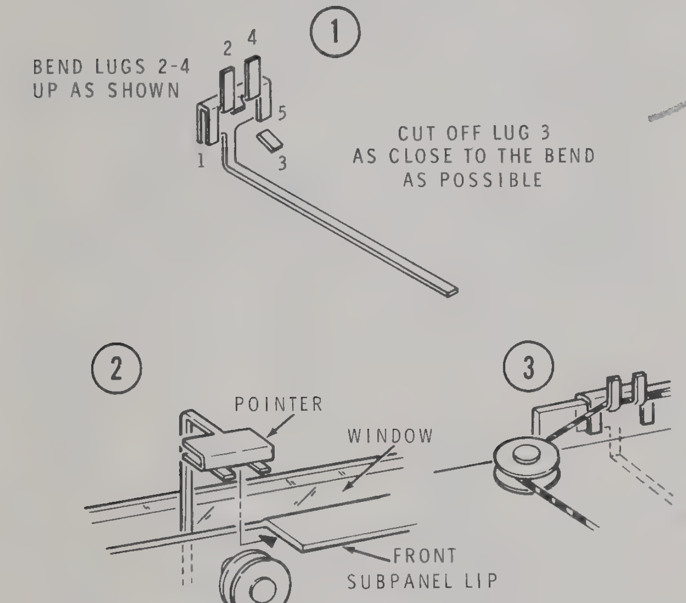
7
1
STRETCHED
SPRING
8
9
1 TURN
KNOTTED
DIAL CORD
SETSCREW
OPENING

Detail 6-14A

( ) Refer to Part 1 of Detail 6-14B and cut off lug 3 of the pointer. Then bend lugs 2 and 4 up as shown.

( ) Install the pointer on the front subpanel lip as shown in Part 2 of Detail 6-14B.

( ) Position the dial cord over the pointer tabs as shown in Part 3 of Detail 6-14B. The pointer will be secured to the cord later.


①
BEND LUGS 2-4 UP AS SHOWN
2
4
5
1
3
CUT OFF LUG 3 AS CLOSE TO THE BEND AS POSSIBLE
②
POINTER
WINDOW
FRONT SUBPANEL LIP
③

INSERT THE POINTER BETWEEN THE FRONT SUBPANEL AND THE WINDOW IN THE POSITION SHOWN. THEN SLIDE THE POINTER ONTO THE FRONT SUBPANEL LIP.

POSITION THE DIAL CORD AROUND THE TWO PRONGS EXACTLY AS INDICATED. DO NOT BEND THE TWO PRONGS AGAINST THE DIAL CORD UNTIL INSTRUCTED TO DO SO.

Detail 6-14B

( ) Rotate the tuning shaft a few times to make sure the dial cord does not slip. If the dial cord does slip, untie the knot and pull the cord taut again.

( ) Using long-nose pliers, carefully pull the shorting springs from transistors Q401 and Q405 on the receiver circuit board.

Refer to Pictorial 6-15 (fold-out from Page 64) for the following steps.

( ) Position the chassis as shown in the Pictorial.

( ) Remove the RF and the mixer Switch-Boards from the chassis.

( ) Using long-nose pliers, carefully pull the shorting spring from the 40673 transistor on each of these Switch-Boards.

( ) Reinstall the Switch-Boards in the chassis.

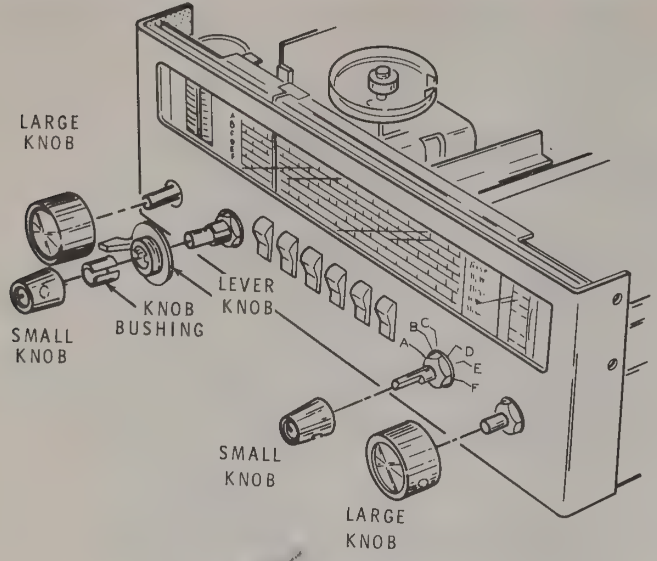
( ) Start an 8-32 x 1/4" setscrew into the bandswitch collar but do not tighten it.

( ) Position the flat side (knob end) of the bandswitch shaft as shown in the Pictorial. Then insert the shaft through the switch detent on the front panel. Slip the bandswitch collar over the end of the shaft with the setscrew positioned as shown. Using extreme care push the shaft through each wafer of the four switchboards. If the shaft stops at a wafer, rotate the shaft slightly in both directions until it goes through the wafer.

( ) Tighten the bandswitch detent control nut.

( ) After the shaft is inserted through each wafer, slide the bandswitch collar against the back of the detent switch and tighten the setscrew.

( ) Refer to the Pictorial and install the bottom shield with three 6-32 x 1/4" screws in the indicated holes.



PICTORIAL 6-16

Refer to Pictorial 6-16 for the following steps.

( ) Rotate the outer sleeve on the AF/RF Gain control fully counterclockwise. Install the lever knob as shown in the Pictorial.

NOTE: Do not overtighten the screws in the knobs that will be installed in the next steps, or the threads may be stripped from the knobs.

( ) Install 8-32 x 3/16" setscrews in the small knobs.

( ) Rotate the inner control shaft fully counterclockwise until you hear it click into the OFF position. Then install a knob bushing and a small knob on the control shaft with the knob pointer in the OFF position.

( ) Rotate the BAND switch fully counterclockwise. Then install a small knob on the control shaft with the setscrew against the flat side of the shaft.

( ) Install 8-32 x 7/16" setscrews in the large knobs.

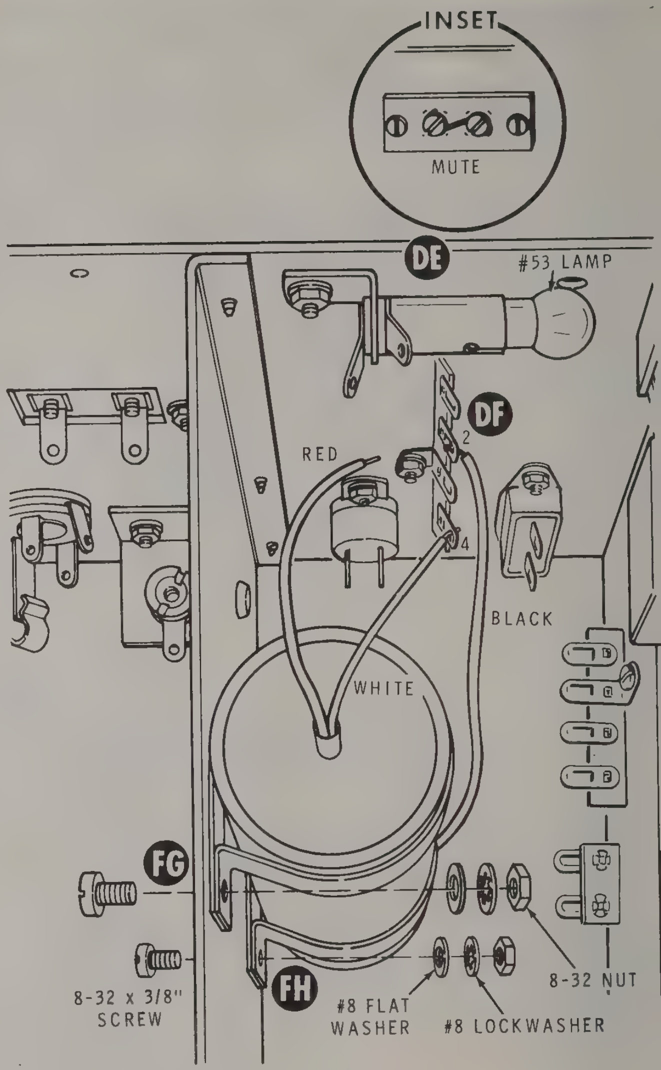
( ) Install a large knob on the Tuning shaft.

( ) Install a large knob on the Bandspread tuning shaft.

Refer to Pictorial 6-17 for the following steps.

( ) Loosely mount the battery clamps at FG and FH on the speaker shield with 8-32 x 3/8" hardware and a #8 flat washer. Position the clamps as shown.

( ) Insert the battery into the battery clamps with the black lead down. Now tighten the battery clamp hardware.



PICTORIAL 6-17

( ) Remove the tape from the white battery lead and connect the lead to lug 4 of terminal strip DF (S-2).

( ) Remove the tape from the black battery lead and connect the lead to lug 2 of terminal strip DF (S-3).

NOTE: The red wire from the battery will be connected later.

( ) Install the #53 lamp into the lamp socket at DE.

( ) Connect a 1" length of bare wire between the screws of the MUTE terminal strip on the rear of the Receiver as shown in the inset drawing on Pictorial 6-17.

Set the chassis aside temporarily.

CABINET TOP PARTS MOUNTING

Refer to Pictorial 6-18 for the following steps.

( ) Position the cabinet top as shown in the Pictorial.

( ) Unpack the handle, end caps, and clamps.

( ) Position the handle on the cabinet top with the curved side of the handle ends as shown. Then mount the handle to the cabinet top with clamps and 4-40 x 3/8" hardware at GA and GB. Do not overtighten the hardware or it may be hard to install the end caps in the following steps.

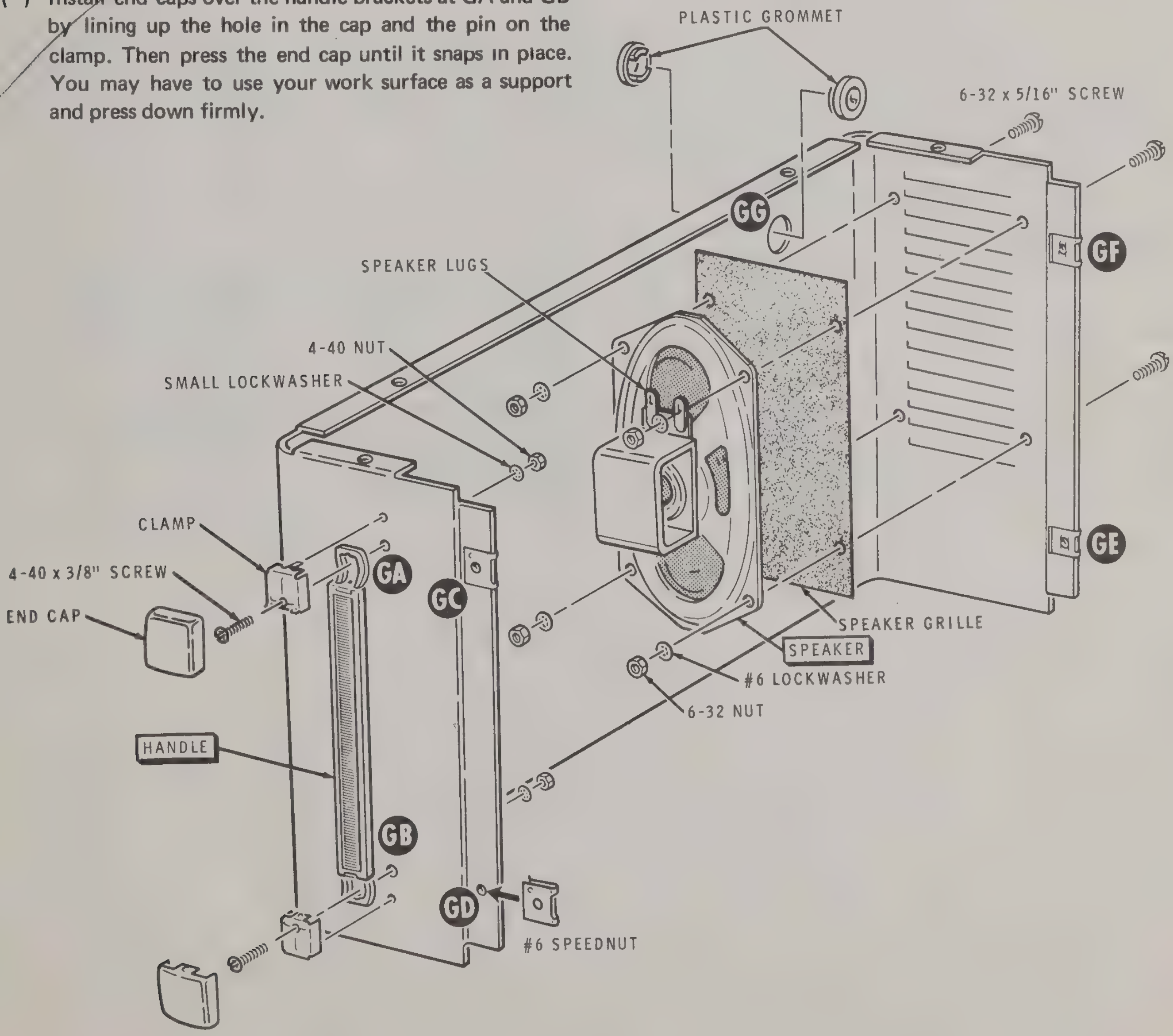
( ) Install end caps over the handle brackets at GA and GB by lining up the hole in the cap and the pin on the clamp. Then press the end cap until it snaps in place. You may have to use your work surface as a support and press down firmly.

( ) Install #6 speednuts at GC, GD, GE, and GF on the cabinet top. Be sure to position the flat side of the speednuts as shown.

( ) Install an antenna grommet at GG by inserting a grommet half into the hole from both sides of the cabinet top. Then press firmly against each grommet half until they lock in place.

( ) Mount the speaker and speaker grille to the cabinet top with 6-32 x 5/16" hardware. Be sure to position the speaker lugs as shown in the Pictorial.

Set the cabinet top aside.


PLASTIC GROMMET
6-32 x 5/16" SCREW
GG
GF
SPEAKER LUGS
4-40 NUT
SMALL LOCKWASHER
CLAMP
4-40 x 3/8" SCREW
END CAP
GA
GC
GE
SPEAKER GRILLE
SPEAKER
#6 LOCKWASHER
6-32 NUT
HANDLE
GB
GD
#6 SPEEDNUT

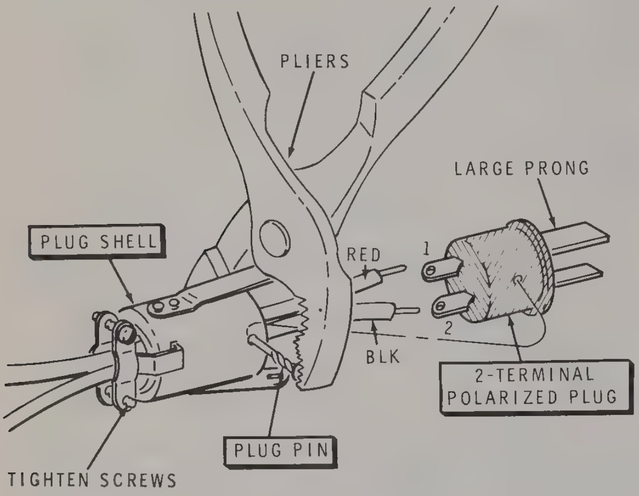
PICTORIAL 6-18

DC POWER CABLE WIRING

Refer to Pictorial 6-19 for the following steps.

( ) Measure and cut the lengths of red stranded and black stranded wire to the same length.

( ) Remove 3/8" of insulation from both ends of each wire. Twist together the strands at the end of each wire. Then melt a small amount of solder on the wire strands to hold them together.



PICTORIAL 6-19

( ) Locate the 2-terminal polarized plug assembly (#432-29).

( ) If necessary, disassemble the plug assembly by first removing the plug pin.

( ) Insert one end of the red stranded wire and one end of the black stranded wire through the plug shell.

( ) Connect the red stranded wire to lug 1 of the 2-terminal polarized plug (S-1). The numbers are molded into the back of the plug.

( ) Connect the black stranded wire to lug 2 of the 2-terminal polarized plug (S-1).

( ) Push the 2-terminal polarized plug into the plug shell so the holes for the plug pin are in line. Start the plug pin into its hole with your fingers. Then crimp it into place with a pair of pliers. Tighten the two screws on the plug shell.

( ) Set the cable aside until it is needed.

This completes the Step-By-Step Assembly section of the Manual. All connections should be soldered except lug 1 of terminal strip DF. All wires should be connected except the red battery lead and the white wire from hole 12 in the receiver circuit board. These two wires will be connected later. Remove any wire clippings or solder splashes that may be lodged in the wiring. Then proceed to the Initial Tests section of the Manual.

INITIAL

NOTE: A VTVM or a V
resistance and voltage te
VOM having an impeda
not be used for the tests.

RESISTANCE TEST

( ) Position all front pan
following positions:

BANDSPREAD—fully c
AF GAIN—OFF (black
RF GAIN—fully clockw
RCV-STBY—RCV positi
CAL—to position opposi
AM-CW/SSB—CW/SSB p
AVC-MVC—MVC positio
ANL-OFF—OFFposition.
BAND—band A position.
MAIN TUNING—fully co

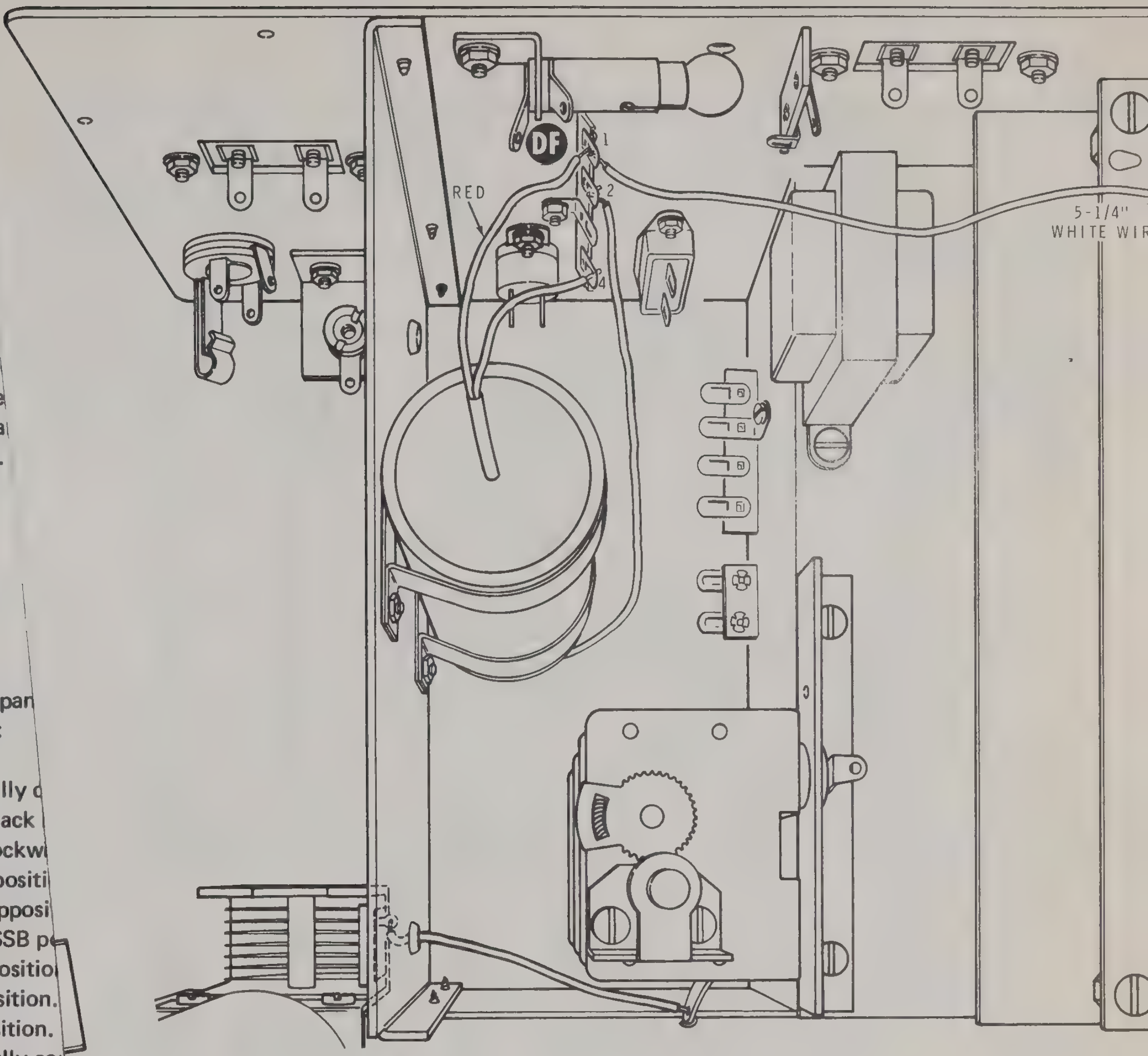


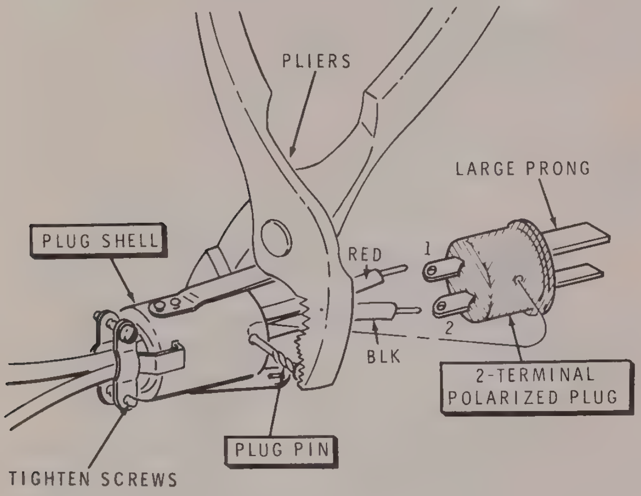
FIGURE 3

DC POWER CABLE WIRING

Refer to Pictorial 6-19 for the following steps.

( ) Measure and cut the lengths of red stranded and black stranded wire to the same length.

( ) Remove 3/8" of insulation from both ends of each wire. Twist together the strands at the end of each wire. Then melt a small amount of solder on the wire strands to hold them together.



PICTORIAL 6-19

( ) Locate the 2-terminal polarized plug assembly (#432-29).

( ) If necessary, disassemble the plug assembly by first removing the plug pin.

( ) Insert one end of the red stranded wire and one end of the black stranded wire through the plug shell.

( ) Connect the red stranded wire to lug 1 of the 2-terminal polarized plug (S-1). The numbers are molded into the back of the plug.

( ) Connect the black stranded wire to lug 2 of the 2-terminal polarized plug (S-1).

( ) Push the 2-terminal polarized plug into the plug shell so the holes for the plug pin are in line. Start the plug pin into its hole with your fingers. Then crimp it into place with a pair of pliers. Tighten the two screws on the plug shell.

( ) Set the cable aside until it is needed.

This completes the Step-By-Step Assembly section of the Manual. All connections should be soldered except lug 1 of terminal strip DF. All wires should be connected except the red battery lead and the white wire from hole 12 in the receiver circuit board. These two wires will be connected later. Remove any wire clippings or solder splashes that may be lodged in the wiring. Then proceed to the Initial Tests section of the Manual.

INITIAL TESTS

NOTE: A VTVM or a VOM will be necessary to perform the resistance and voltage tests in this section of the Manual. A VOM having an impedance lower than 20 kΩ/volt should not be used for the tests.

RESISTANCE TEST

( ) Position all front panel switches and controls in the following positions:

BANDSPREAD—fully counterclockwise.
AF GAIN—OFF (black knob).
RF GAIN—fully clockwise (silver knob).
RCV-STBY—RCV position.
CAL—to position opposite CAL.
AM-CW/SSB—CW/SSB position.
AVC-MVC—MVC position.
ANL-OFF—OFFposition.
BAND—band A position.
MAIN TUNING—fully counterclockwise.

( ) Position the METER ADJUST control on receiver circuit board-rotate control fully clockwise and then 1/4 turn counterclockwise when viewed from the rear of the Receiver. See Figure 4 (fold-out from Page 73).

Refer to Figure 1 (fold-out from Page 69) for the following steps.

NOTE: The following tests are performed to be sure that the Kit has been wired properly and that no short circuits exist in the supply circuits. If the proper results are not obtained, refer to the "In Case of Difficulty" section of the Manual.

( ) Connect the meter common lead to the chassis and touch the ohms lead to the 5-1/4" white hookup wire extending from hole 12 in the receiver circuit board as shown.

( ) The meter should indicate approximately 120 Ω.

( ) Turn on the Receiver. There should be no change in the meter indication. Then turn OFF the Receiver.

( ) Disconnect the ohms lead from the white wire.

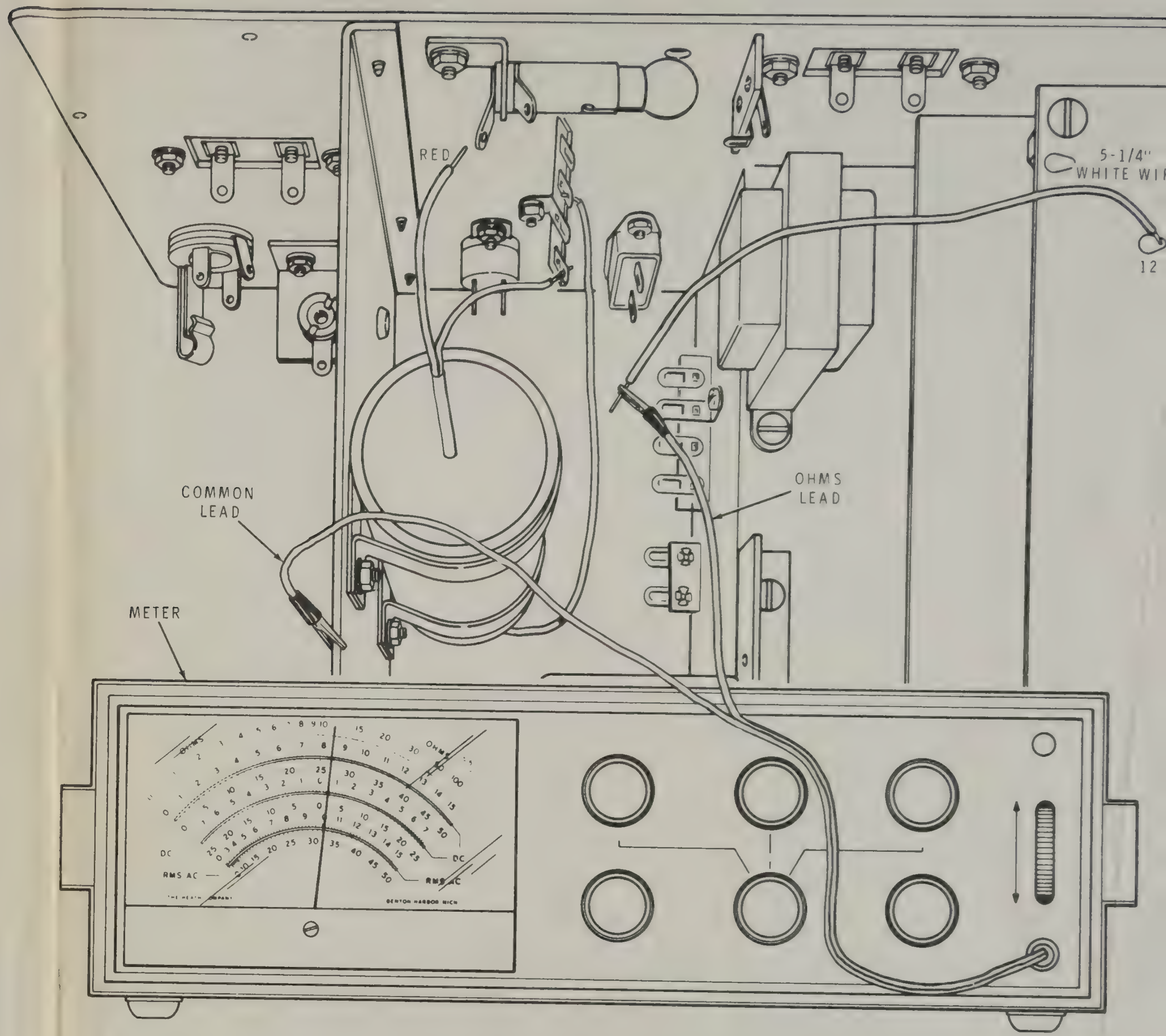


FIGURE 1

VOLTAGE TEST

Refer to Figure 2 for the following steps.

( ) Adjust the meter to read DC volts on the +15 volt range.

( ) Remove the tape from the red battery lead.

( ) Connect the meter DC volts lead to the red battery lead as shown.

( ) The meter should indicate zero volts.

( ) Turn on the Receiver. The meter should now indicate approximately 9.6 volts. Then turn OFF the Receiver.

( ) Disconnect the meter leads.

BATTERY WIRING AND CHARGING

Refer to Figure 3 (fold-out from this page) for the following steps.

( ) Connect the 5-1/4" white hookup wire coming from hole 12 in the receiver circuit board to lug 1 of terminal strip DF (NS).

( ) Connect the red battery lead to lug 1 of terminal strip DF (S-4).

NOTE: The Receiver can be wired to charge from either a 120 VAC or 240 VAC power source as well as 12 to 15 VDC. In the following steps, connect the Receiver to the AC power source for which it has been wired, or to a DC power source.

( ) Connect the Receiver to the proper charging source, but do not turn the Receiver on for at least 24 hours to allow the battery to charge. Refer to Figure 3A for connecting the DC charging cable to the Receiver and a DC power source.

( ) After the battery has charged, disconnect the Receiver from the power source.

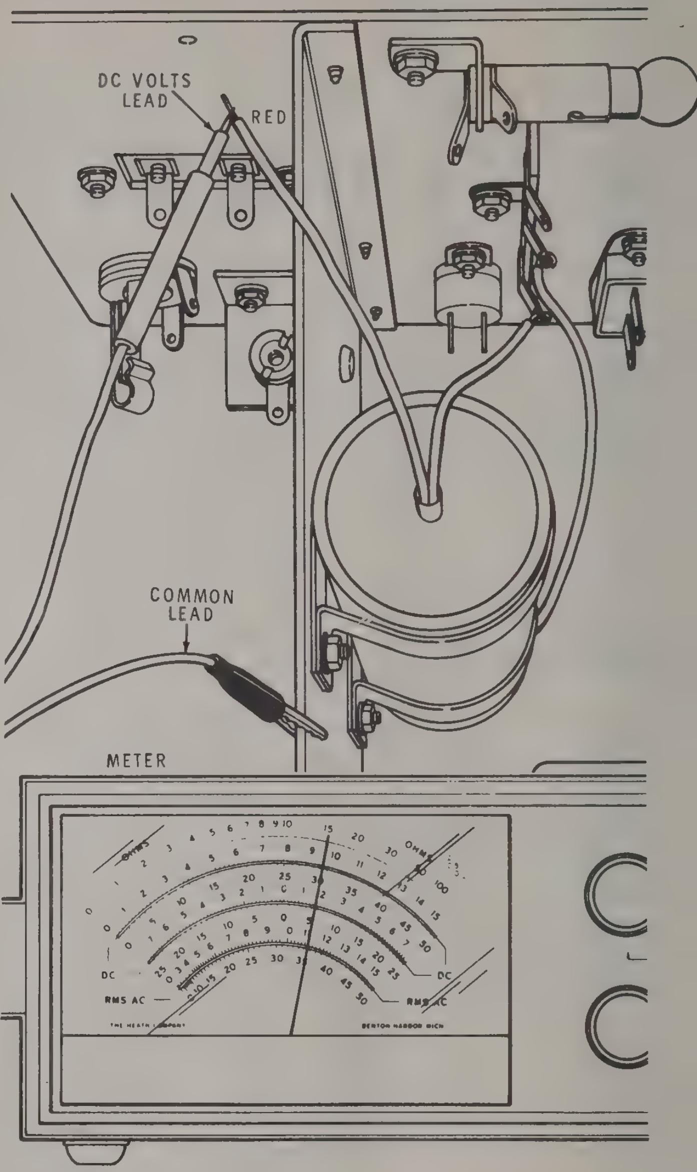


Figure 2

METER ADJUSTMENT AND NOISE TEST

Refer to Figure 4 (fold-out from Page 73) for the following steps.

NOTE: If you do not obtain the correct results in any of the following tests, turn OFF the Receiver and refer to the In Case of Difficulty section of the Manual.

( ) Connect the speaker leads.

( ) Turn on the Receiver. Adjust the METER ADJUST control with a small screwdriver so the meter needle is between the 0 (zero) and the 1 (one) on the scale. You should hear background noise. (You should also be able to increase and decrease the noise with the AF GAIN control.)

( ) Now increase the AF GAIN control until the background noise is louder than the average listening level.

( ) Touch the metal tip of a small screwdriver to the indicated end of the resistor shown in the Figure. Then place your finger against the metal shaft of the screwdriver. The background noise should increase slightly.

( ) Place the AM-CW/SSB switch in the AM position. The background noise should decrease in volume.

( ) Place the ANL-OFF switch in the ANL position. There should be a further decrease in the background noise volume.

( ) Press the LIGHT switch. Both panel lamps should light.

( ) Place the RCV-STBY switch in the STBY position. The background noise should stop. Then turn the switch to the RCV position.

( ) Turn the Receiver off.

This completes the Initial Tests section of the Manual.

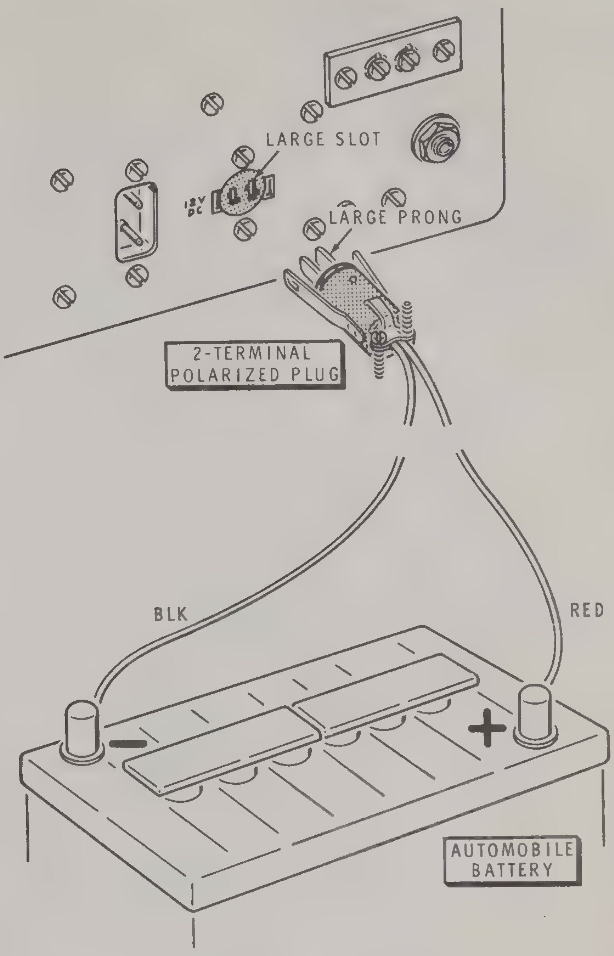


Figure 3-A

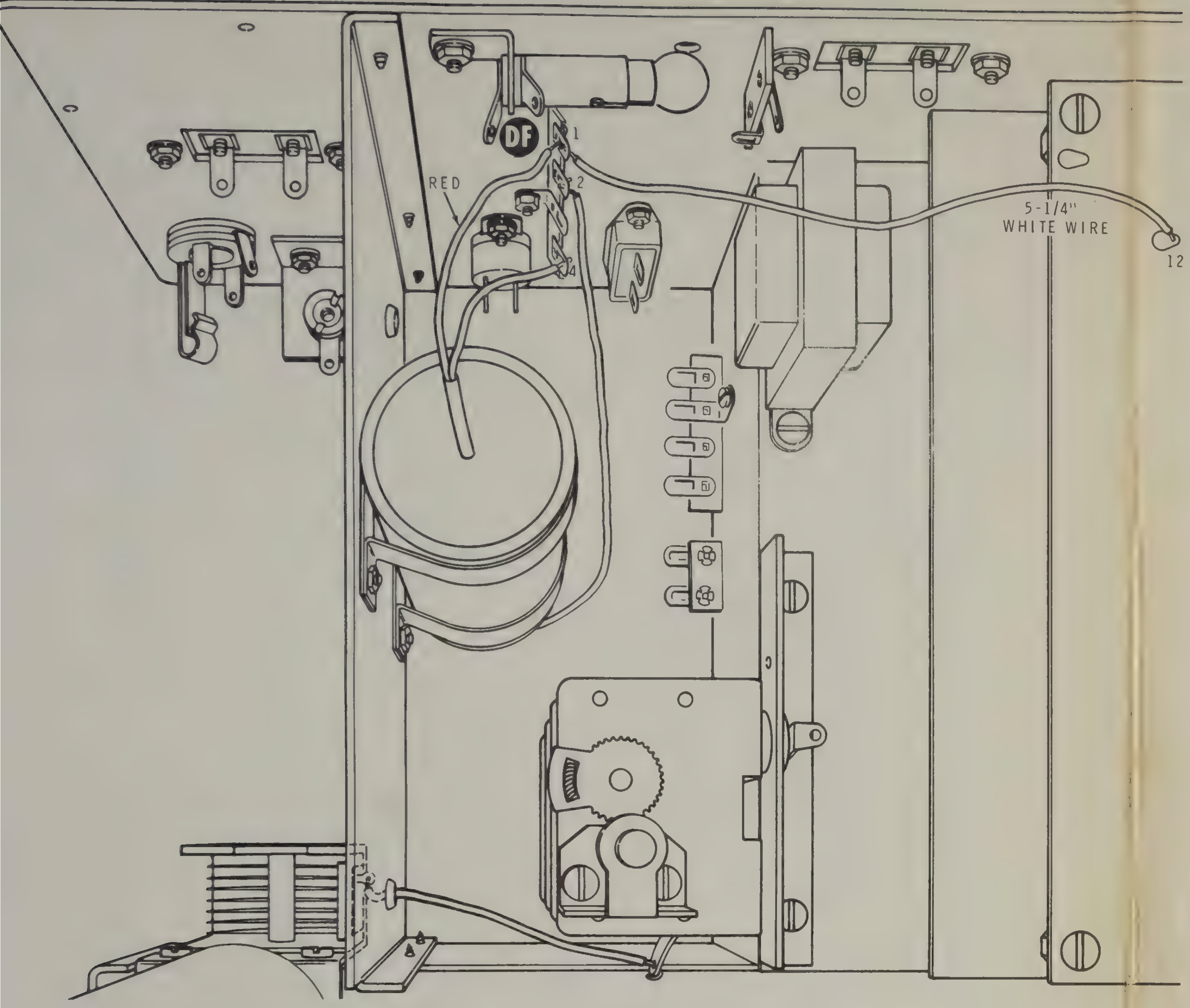


FIGURE 3

VOLTAGE TEST

Refer to Figure 2 for the following steps.

( ) Adjust the meter to read DC volts on the +15 volt range.

( ) Remove the tape from the red battery lead.

( ) Connect the meter DC volts lead to the red battery lead as shown.

( ) The meter should indicate zero volts.

( ) Turn on the Receiver. The meter should now indicate approximately 9.6 volts. Then turn OFF the Receiver.

( ) Disconnect the meter leads.

BATTERY WIRING AND CHARGING

Refer to Figure 3 (fold-out from this page) for the following steps.

( ) Connect the 5-1/4" white hookup wire coming from hole 12 in the receiver circuit board to lug 1 of terminal strip DF (NS).

( ) Connect the red battery lead to lug 1 of terminal strip DF (S-4).

NOTE: The Receiver can be wired to charge from either a 120 VAC or 240 VAC power source as well as 12 to 15 VDC. In the following steps, connect the Receiver to the AC power source for which it has been wired, or to a DC power source.

( ) Connect the Receiver to the proper charging source, but do not turn the Receiver on for at least 24 hours to allow the battery to charge. Refer to Figure 3A for connecting the DC charging cable to the Receiver and a DC power source.

( ) After the battery has charged, disconnect the Receiver from the power source.

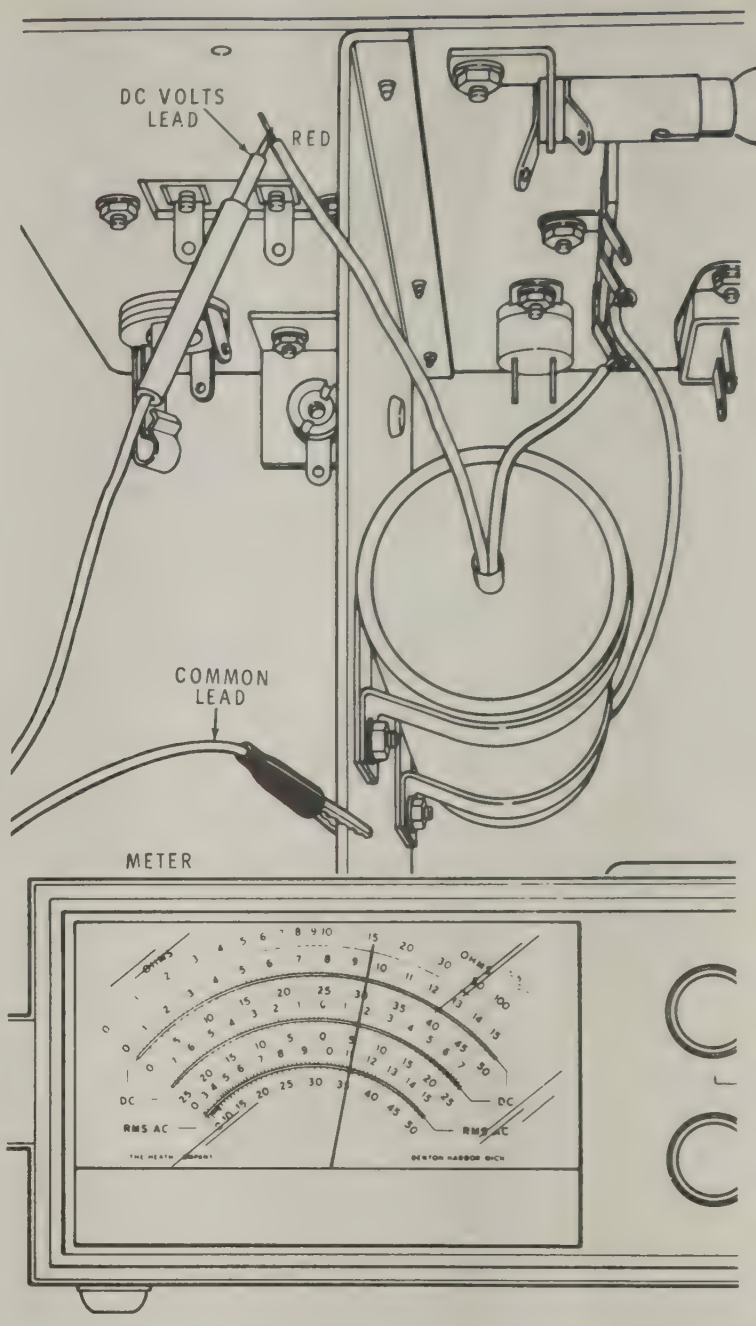


Figure 2

METER ADJUSTMENT AND NOISE TEST

Refer to Figure 4 (fold-out from Page 73) for the following steps.

NOTE: If you do not obtain the correct results in any of the following tests, turn OFF the Receiver and refer to the In Case of Difficulty section of the Manual.

( ) Connect the speaker leads.

( ) Turn on the Receiver. Adjust the METER ADJUST control with a small screwdriver so the meter needle is between the 0 (zero) and the 1 (one) on the scale. You should hear background noise. (You should also be able to increase and decrease the noise with the AF GAIN control.)

( ) Now increase the AF GAIN control until the background noise is louder than the average listening level.

( ) Touch the metal tip of a small screwdriver to the indicated end of the resistor shown in the Figure. Then place your finger against the metal shaft of the screwdriver. The background noise should increase slightly.

( ) Place the AM-CW/SSB switch in the AM position. The background noise should decrease in volume.

( ) Place the ANL-OFF switch in the ANL position. There should be a further decrease in the background noise volume.

( ) Press the LIGHT switch. Both panel lamps should light.

( ) Place the RCV-STBY switch in the STBY position. The background noise should stop. Then turn the switch to the RCV position.

( ) Turn the Receiver off.

This completes the Initial Tests section of the Manual.

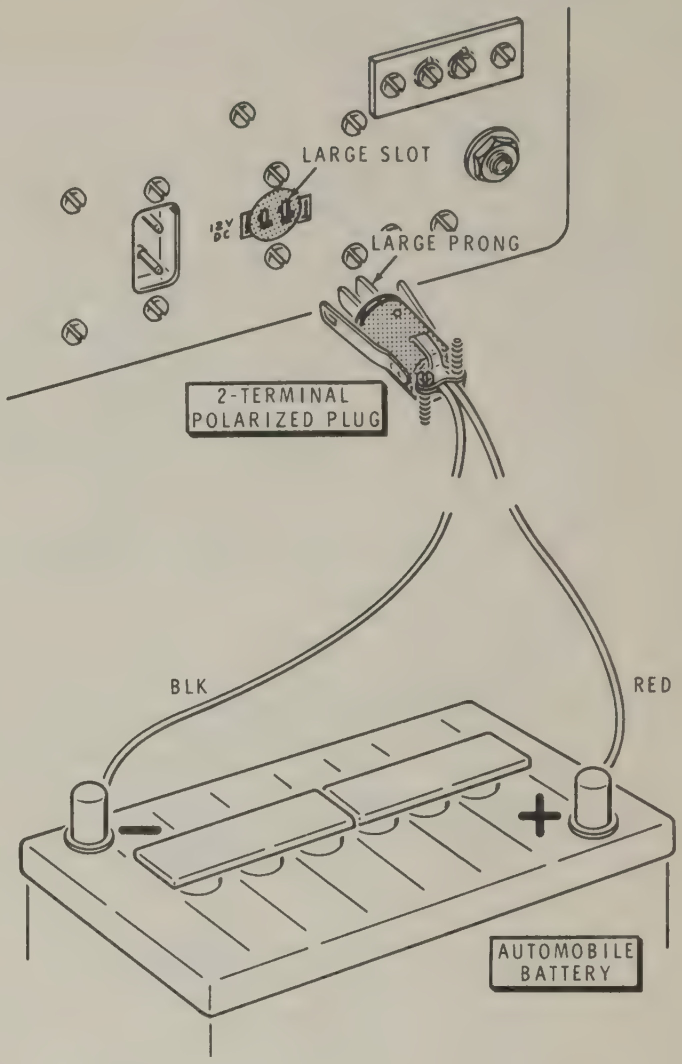


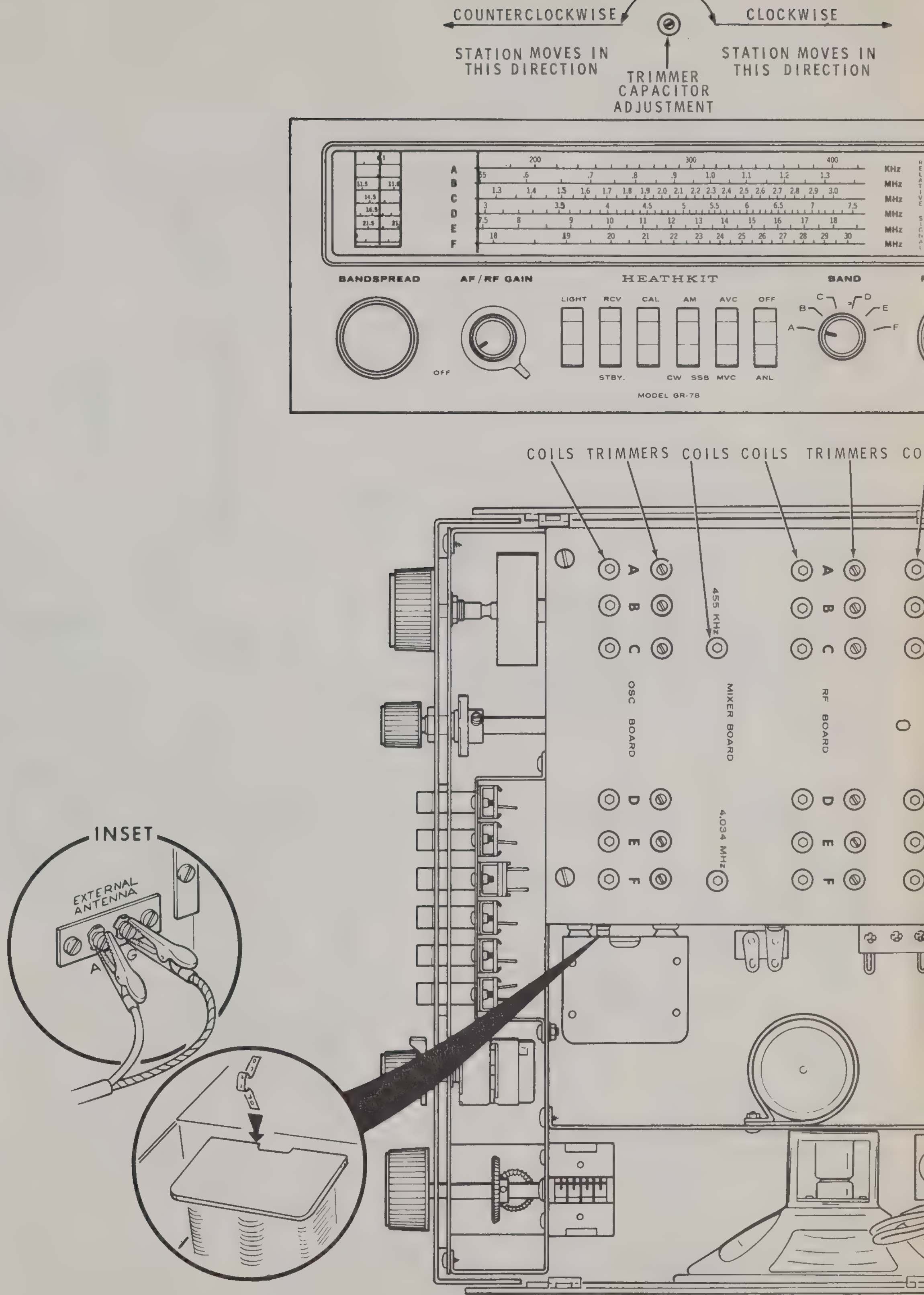
Figure 3-A

ALIGN

Refer to Figure 4 for t

NOTE: In the followi
up properly on the (
aligned. It may be ne
pointer slightly.

( ) Rotate the MAI
The pointer shou
white lines at the
pointer tabs on t
#1 on Figure 4.
fully countercloc
plates should be
should be even w
left end of the
alignment is corre
incorrect.



COUNTERCLOCKWISE
CLOCKWISE
STATION MOVES IN THIS DIRECTION
STATION MOVES IN THIS DIRECTION
TRIMMER CAPACITOR ADJUSTMENT
A B C D E F
KHz MHz MHz MHz MHz MHz
BANDSPREAD
AF/RF GAIN
HEATHKIT
BAND
LIGHT RCV CAL AM AVC OFF
OFF
STBY. CW SSB MVC ANL
MODEL GR-78
COILS TRIMMERS COILS COILS TRIMMERS CO
OSC BOARD
455 KHz
MIXER BOARD
4.034 MHz
RF BOARD
INSET
EXTERNAL ANTENNA
A

FIGURE 5

ALIGNMENT

Refer to Figure 4 for the following steps.

NOTE: In the following step, be sure the dial pointer lines up properly on the dial so the Receiver will be properly aligned. It may be necessary to adjust the position of the pointer slightly.

( ) Rotate the MAIN TUNING control fully clockwise. The pointer should line up with the ends of the six white lines at the right end of the dial. Crimp the dial pointer tabs on the dial cord as shown in inset drawing #1 on Figure 4. Now turn the MAIN TUNING dial fully counterclockwise. The main tuning capacitor plates should be fully meshed and the dial pointer should be even with the ends of the white lines at the left end of the dial. Check to make sure that this alignment is correct or the Receiver's calibration will be incorrect.

( ) Install the antenna in antenna bushing DD.

( ) Make sure the speaker wires are connected to the speaker.

( ) Position the cabinet top on the chassis by carefully sliding the cabinet top over the whip antenna and pushing it into position. Be careful the antenna grommet does not get pushed from the hole.

( ) Temporarily secure the cabinet top with two #6 x 1/4" sheet metal screws at the location shown in inset drawing #2 on Figure 4.

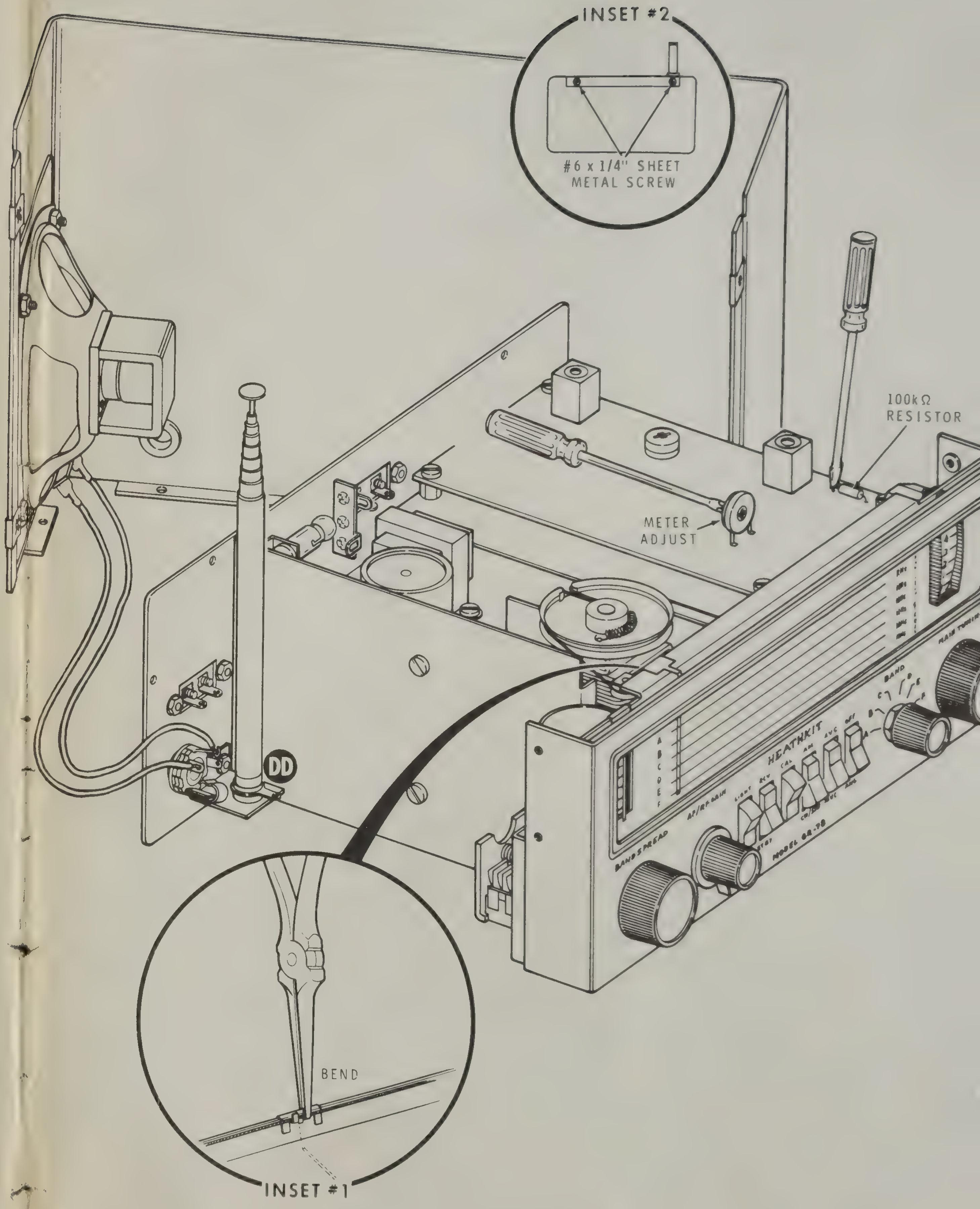

INSET #2
#6 x 1/4" SHEET METAL SCREW
100kΩ RESISTOR
METER ADJUST
DD
HEATHKIT
BANDSPREAD
AF/RF GAIN
BAND
MAIN TUNING
MODEL GR-78
BEND
INSET #1

FIGURE 4

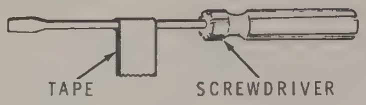


Figure 5A

Refer to Figure 5 (fold-out from this page) for the following steps.

( ) Locate the spring clip (#258-183) and slide it between the variable tuning capacitor and chassis as shown. Press the clip in until its end is even with the top edge of the variable tuning capacitor.

( ) Position the Receiver on its side as shown.

CAUTION: In the following steps you will be instructed to preset the trimmer capacitors so that the pointer will track properly with the dial number. Be sure you do not change the settings of the coils unless instructed to do so in a step. These coils are accurately prealigned at the factory. If their settings are changed without the use of proper instruments and alignment procedure knowledge, the Receiver will tune improperly.

( ) Turn all the trimmer capacitors fully clockwise until they just start to tighten. Then turn each trimmer counterclockwise the number of turns indicated in the following chart. This can be done quite accurately by placing a length of tape on a screwdriver as shown in Figure 5A.

BAND	ANTENNA	RF	OSCILLATOR
A	1/4	1/4	1/8
B	3/4	3/4	1/3
C	2/3	1/2	1-1/8
D	1	3/4	1-1/4
E	1/3	1/3	3/4
F	1-1/4	1/2	1-1/4

NOTE: The Receiver can be aligned with instruments or without instruments. Instrument alignment will result in an increase in accuracy and sensitivity. However, it requires the use of an RF generator that can deliver a modulated signal from 190 kHz to 30 MHz. If a generator is available, proceed to "Alignment With Instrument" on Page 77. Otherwise proceed with "Alignment Without Instruments."

ALIGNMENT WITHOUT INSTRUMENTS

The alignment without instruments is accomplished by using signals of known frequencies from radio stations. For best results, use an external antenna. If an external antenna is not already available, refer to "Antenna Installation" on Page 89.

In the following steps, only the trimmer capacitors will be adjusted. The coils are preadjusted and should not be changed. The ANT and RF trimmers will be adjusted for peak (strongest) signals using the Relative Signal meter in the Receiver. If the signal is too weak for a good meter indication, it will be necessary to adjust the trimmers for the loudest signal from the speaker. The OSC trimmers will be adjusted so that the received station appears at the proper frequency on the dial.

A station near the high end of the band should be selected for best results. Refer to the following information concerning station location and identification for bands A through F.

BAND A

Refer to Page 91 in this Manual and to Page 3 in the "Heathkit Logs and Charts" book supplied with the Kit. Select a weather information station in your area, or call a local airport to see if there is a low-frequency navigation beacon station operating near your location.

BAND B

Refer to your newspaper for some local broadcast stations that can be received in your area. For best results, choose a station near the high frequency end of the band.

BANDS C THROUGH F

These bands can be aligned by using broadcast stations between 1.3 to 1.6 MHz, or one of the following types of stations:

The United States Government operates two radio stations that give standard time and frequency signals: WWV in Boulder, Colorado, and WWVH in Hawaii. These stations transmit on the following frequencies: 2.5 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz, and 25 MHz. The transmitted signals include a ticking sound (one-second time ticks), 440 Hz and 600 Hz audio tones, station identification in Internation Morse Code, voice, or voice and Morse Code time signals. These signals are usually best received early in the morning or late at night.

The other types of stations are a marine station, radiotelephone, an amateur radio or CB station. If you or a friend has a marine radiotelephone and know what the transmitting frequency is, it can be used to align band C. The amateur radio station can be used to align bands C through F. The CB station can be used to align band F only. If one of these two types of stations is used, the pointer on the Receiver main tuning dial must be set to the exact frequency of the transmitting station.

( ) Set the controls and switches as follows:

BANDSPREAD—Fully counterclockwise.
AF GAIN—OFF.
RF GAIN—Fully clockwise.
RCV-STBY—RCV.
CAL—To position opposite CAL.
AM-CW/SSB—AM.
AVC-MVC—AVC.
ANL-OFF—OFF.
BAND—Band B.
TUNING—Fully clockwise.

( ) Turn the Receiver on and set the AF GAIN control to the desired listening level.

NOTE: It is desirable to align band B first, because of the greater number of stations to choose from. Align all six bands using the following chart.

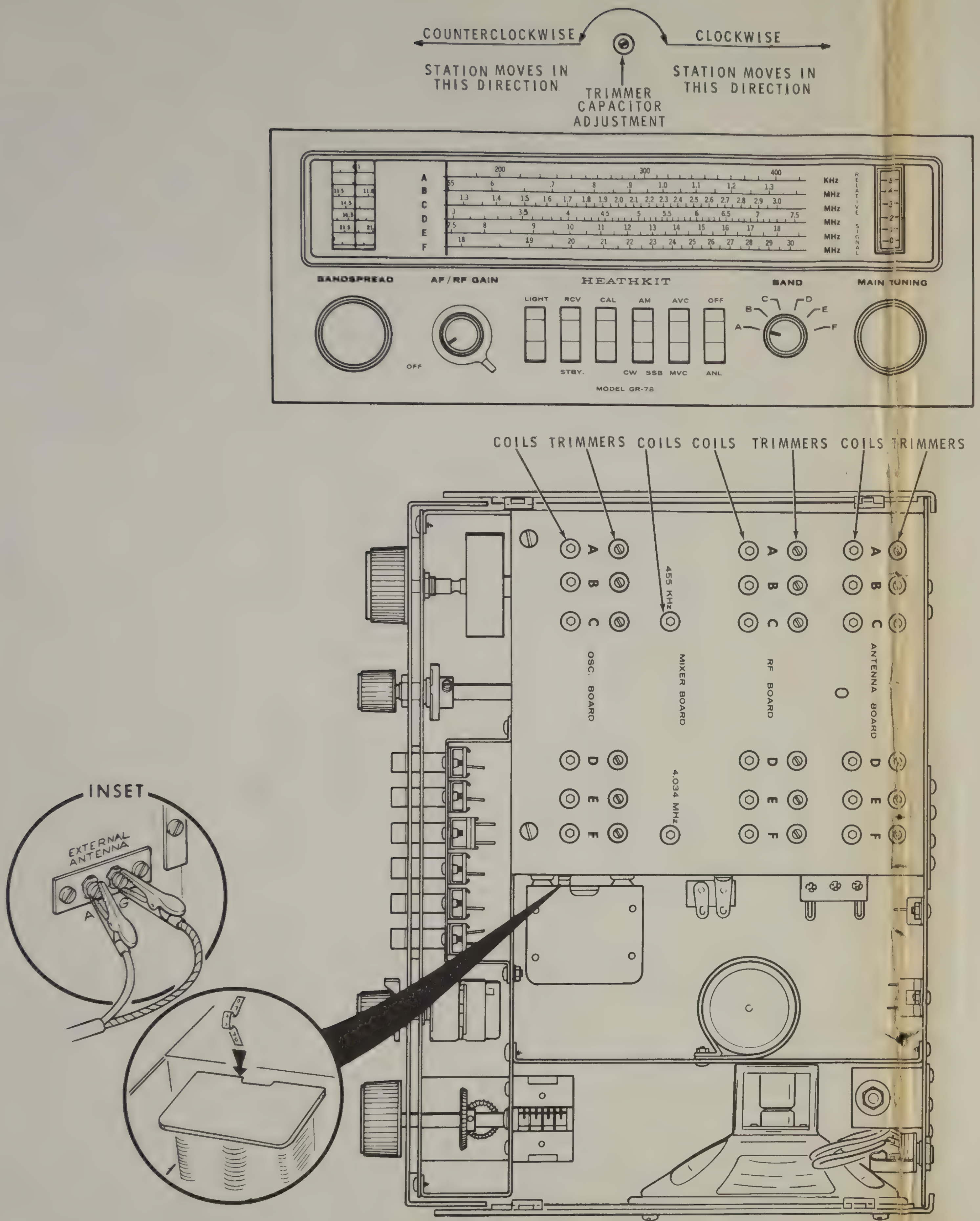

COUNTERCLOCKWISE
CLOCKWISE
STATION MOVES IN THIS DIRECTION
TRIMMER CAPACITOR ADJUSTMENT
STATION MOVES IN THIS DIRECTION
BANDSPREAD
AF/RF GAIN
HEATHKIT
BAND
MAIN TUNING
LIGHT
RCV
CAL
AM
AVC
OFF
STBY.
CW
SSB
MVC
ANL
OFF
MODEL GR-78
COILS
TRIMMERS
COILS
COILS
TRIMMERS
COILS
TRIMMERS
OSC. BOARD
455 KHz
MIXER BOARD
4.034 MHz
RF BOARD
ANTENNA BOARD
INSET
EXTERNAL ANTENNA
A

FIGURE 5

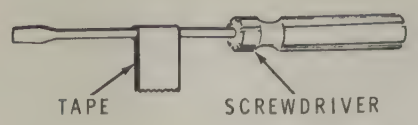

TAPE
SCREWDRIVER

Figure 5A

Refer to Figure 5 (fold-out from this page) for the following steps.

( ) Locate the spring clip (#258-183) and slide it between the variable tuning capacitor and chassis as shown. Press the clip in until its end is even with the top edge of the variable tuning capacitor.

( ) Position the Receiver on its side as shown.

CAUTION: In the following steps you will be instructed to preset the trimmer capacitors so that the pointer will track properly with the dial number. Be sure you do not change the settings of the coils unless instructed to do so in a step. These coils are accurately prealigned at the factory. If their settings are changed without the use of proper instruments and alignment procedure knowledge, the Receiver will tune improperly.

( ) Turn all the trimmer capacitors fully clockwise until they just start to tighten. Then turn each trimmer counterclockwise the number of turns indicated in the following chart. This can be done quite accurately by placing a length of tape on a screwdriver as shown in Figure 5A.

BAND	ANTENNA	RF	OSCILLATOR
A	1/4	1/4	1/8
B	3/4	3/4	1/3
C	2/3	1/2	1-1/8
D	1	3/4	1-1/4
E	1/3	1/3	3/4
F	1-1/4	1/2	1-1/4

NOTE: The Receiver can be aligned with instruments or without instruments. Instrument alignment will result in an increase in accuracy and sensitivity. However, it requires the use of an RF generator that can deliver a modulated signal from 190 kHz to 30 MHz. If a generator is available, proceed to "Alignment With Instrument" on Page 77. Otherwise proceed with "Alignment Without Instruments."

ALIGNMENT WITHOUT INSTRUMENTS

The alignment without instruments is accomplished by using signals of known frequencies from radio stations. For best results, use an external antenna. If an external antenna is not already available, refer to "Antenna Installation" on Page 89.

In the following steps, only the trimmer capacitors will be adjusted. The coils are preadjusted and should not be changed. The ANT and RF trimmers will be adjusted for peak (strongest) signals using the Relative Signal meter in the Receiver. If the signal is too weak for a good meter indication, it will be necessary to adjust the trimmers for the loudest signal from the speaker. The OSC trimmers will be adjusted so that the received station appears at the proper frequency on the dial.

A station near the high end of the band should be selected for best results. Refer to the following information concerning station location and identification for bands A through F.

BAND A

Refer to Page 91 in this Manual and to Page 3 in the "Heathkit Logs and Charts" book supplied with the Kit. Select a weather information station in your area, or call a local airport to see if there is a low-frequency navigation beacon station operating near your location.

BAND B

Refer to your newspaper for some local broadcast stations that can be received in your area. For best results, choose a station near the high frequency end of the band.

BANDS C THROUGH F

These bands can be aligned by using broadcast stations between 1.3 to 1.6 MHz, or one of the following types of stations:

The United States Government operates two radio stations that give standard time and frequency signals: WWV in Boulder, Colorado, and WWVH in Hawaii. These stations transmit on the following frequencies: 2.5 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz, and 25 MHz. The transmitted signals include a ticking sound (one-second time ticks), 440 Hz and 600 Hz audio tones, station identification in Internation Morse Code, voice, or voice and Morse Code time signals. These signals are usually best received early in the morning or late at night.

The other types of stations are a marine station, radiotelephone, an amateur radio or CB station. If you or a friend has a marine radiotelephone and know what the transmitting frequency is, it can be used to align band C. The amateur radio station can be used to align bands C through F. The CB station can be used to align band F only. If one of these two types of stations is used, the pointer on the Receiver main tuning dial must be set to the exact frequency of the transmitting station.

( ) Set the controls and switches as follows:

BANDSPREAD—Fully counterclockwise.
AF GAIN—OFF.
RF GAIN—Fully clockwise.
RCV-STBY—RCV.
CAL—To position opposite CAL.
AM-CW/SSB—AM.
AVC-MVC—AVC.
ANL-OFF—OFF.
BAND—Band B.
TUNING—Fully clockwise.

( ) Turn the Receiver on and set the AF GAIN control to the desired listening level.

NOTE: It is desirable to align band B first, because of the greater number of stations to choose from. Align all six bands using the following chart.

TRIMMER CAPACITOR ADJUSTMENT	PROCEDURE FOR BANDS A, B, C, D, E, AND F.
OSCILLATOR	Tune in a station with a known frequency near the high frequency (right) end of the band. Check the dial to see if the pointer is exactly on, above, or below the correct transmitting frequency of the station. If the pointer is exactly on the correct frequency, proceed to the antenna trimmer adjustment. If the pointer is above the correct frequency, proceed with step A. If the pointer is below the correct frequency, proceed to step B. NOTE: When turning an oscillator trimmer capacitor counterclockwise, the station will move toward the low frequency (left) end of the dial. Turning the oscillator trimmer capacitor clockwise will move the station toward the high frequency (right) end of the dial. In the following steps, you will be instructed to turn the trimmer capacitors counterclockwise or clockwise. Read each step and understand it before performing the step. A. If the pointer is above the correct frequency, turn the TUNING control counterclockwise until the pointer indicates the correct transmitting frequency of the station. Now turn the oscillator trimmer capacitor slowly in a counterclockwise direction until you can hear the station again. Now proceed to the antenna trimmer adjustment. B. If the pointer is below the correct frequency, turn the TUNING control clockwise until the pointer indicates the correct transmitting frequency of the station. Now turn the oscillator trimmer capacitor slowly in a clockwise direction until you can hear the station again. Now proceed to the antenna trimmer adjustment. Tune in the station for a maximum meter reading. Check to be sure the pointer is exactly over the correct transmitting frequency. If the pointer is not, repeat this adjustment.

NOTE: If you are not satisfied with the alignment at this time, you can turn the oscillator trimmer capacitor clockwise until it is snug. Then return to the start of the Alignment section and begin again.

ANTENNA	Adjust slowly for a maximum meter needle reading. When the meter needle is approaching full-scale (toward 5), turn the RF GAIN control counterclockwise until a half scale reading is obtained.
RF	Adjust slowly for a maximum meter reading.

( ) Adjust the 455 kHz mixer coil for a maximum meter indication with the Receiver tuned to any station on band B.

( ) Adjust the 4.034 MHz mixer coil for a maximum meter indication with the Receiver tuned to any station on band F. This should take no more than a full rotation in either direction. If you do not obtain this peak within one full rotation in either direction, you may have the oscillator set to an image frequency. Return the oscillator trimmer capacitor until the same station is received at a different oscillator trimmer setting. Then repeak the mixer coil.

( ) Turn the Receiver off.

This completes the "Alignment Without Instruments."

Proceed to the BFO Alignment on Page 80.

ALIGNMENT WITH INSTRUMENTS

NOTE: To perform the steps in this section, it is necessary to have a signal generator that is capable of delivering a modulated signal within a frequency range of 190 kHz to 30 MHz.

( ) Refer to Figure 5 (fold-out from Page 74) for the following steps.

( ) Set the controls and switches of the Receiver as follows:

BANDSPREAD—Fully counterclockwise.
AF GAIN—OFF.
RF GAIN—Fully clockwise.
RCV-STBY—RCV.
CAL—To position opposite CAL.
AM-CW/SSB—AM.
AVC-MVC—AVC.
ANL-OFF—OFF.
BAND—Band A.
TUNING—Fully clockwise.

( ) Refer to the inset drawing in the Figure and connect the generator to the EXTERNAL ANT terminals on the rear panel of the Receiver.

( ) Be sure the whip antenna is fully collapsed.

( ) Turn on the signal generator and allow it to warm up.

NOTE: In all alignment steps, as the adjustments peak, reduce the signal generator's output to the lowest possible level so as not to overload the Receiver. A good output level will result in a midscale reading on the signal strength meter.

Since the antenna (ANT), RF, mixer, and oscillator (OSC) coils have been pretuned at the factory, only a slight adjustment should be required to peak them. Perform the steps in the following Alignment Chart. Use the alignment tool furnished with the Kit to adjust the coils.

ALIGNMENT CHART

	TUNE SIGNAL GENERATOR TO:	SET BAND SWITCH TO:	SET RECEIVER DIAL TO:	ADJUST FOR MAXIMUM METER READING
1.	400 kHz NOTE: It may be necessary to use a high signal output from the generator for steps 1, 3, 6, 8, 11, 13, 16, 19, 21, and 25.	A	400 kHz	Band A OSC trimmer until tone is heard
2.	400 kHz	A	400 kHz	A ANTENNA trimmer A RF trimmer 455 kHz MIXER coil
3.	200 kHz	A	200 kHz	A OSC coil until tone is heard
4.	200 kHz	A	200 kHz	A ANTENNA coil A RF coil
5.	Repeat steps 1 through 4 until no further improvement is noticed.			
6.	1.3 MHz	B	1.3 MHz	B OSC trimmer until tone is heard
7.	1.3 MHz	B	1.3 MHz	B ANTENNA trimmer B RF trimmer
8.	.6 MHz	B	.6 MHz	B OSC coil until tone is heard
9.	.6 MHz	B	.6 MHz	B ANTENNA coil B RF coil
10.	Repeat steps 6 through 9 until no further improvement is noticed.			
11.	3.0 MHz	C	3.0 MHz	C OSC trimmer until tone is heard
12.	3.0 MHz	C	3.0 MHz	C ANTENNA trimmer C RF trimmer 455 kHz Mixer coil
13.	1.3 MHz	C	1.3 MHz	C OSC coil until tone is heard
14.	1.3 MHz	C	1.3 MHz	C ANTENNA coil C RF coil

	TUNE SIGNAL GENERATOR TO:	SET BAND SWITCH TO:	SET RECEIVER DIAL TO:	ADJUST FOR MAXIMUM METER READING
15.	Repeat steps 11 through 14 until no further improvement is noticed.			
16.	7 MHz	D	7 MHz	D OSC trimmer until tone is heard
17.	7 MHz	D	7 MHz	D ANTENNA trimmer D RF trimmer
18.	Leave the Receiver set at 7 MHz. Tune the signal generator to 7.910 MHz and increase its output. A second signal should be audible; this is the image frequency. The signal should be down in magnitude when the circuit is correctly aligned. Tune the signal generator to 6.09 MHz. If the alignment signal is heard at this frequency, the oscillator is incorrectly set 455 kHz below the incoming signal. If this should occur, decrease the trimmer capacity by turning the Band D OSC trimmer counterclockwise until the second signal is heard and peaked on the meter.			
19.	3.0 MHz	D	3.0 MHz	D OSC coil until tone is heard
20.	3.0 MHz	D	3.0 MHz	D ANTENNA coil D RF coil
21.	Repeat steps 16, 17, 19, and 20 until no further improvement is noticed.			
22.	18 MHz	E	18 MHz	E OSC trimmer until tone is heard
23.	17 MHz	E	17 MHz	E ANTENNA trimmer E RF trimmer
24.	Leave the Receiver set at 17 MHz. Tune the signal generator to 16.09 MHz. A second signal should be audible; this is the image frequency. The signal should be down in magnitude when the circuit is correctly aligned. Tune the signal generator to 17.91 MHz. If the alignment signal is heard at this frequency, the oscillator is incorrectly set 455 kHz above the incoming signal. If this should occur, increase the trimmer capacity by turning the Band E OSC trimmer clockwise until the second signal is heard and peaked on the meter.			
25.	8 MHz	E	8 MHz	E OSC coil until tone is heard
26.	8 MHz	E	8 MHz	E ANTENNA coil E RF coil
27.	Repeat steps 22, 23, 25, and 26 until no further improvement is noticed.			
28.	30 MHz	F	30 MHz	F OSC trimmer until tone is heard

TUNE SIGNAL GENERATOR TO:	SET BAND SWITCH TO:	SET RECEIVER DIAL TO:	ADJUST FOR MAXIMUM METER READING
29. 30 MHz	F	30 MHz	F ANTENNA trimmer F RF trimmer 4.034 MHz mixer coil NOTE: If you do not obtain this peak within one full rotation in either direction, you may have the oscillator set to an image frequency. Retune the oscillator trimmer capacitor for another tone and then repeak the mixer coil.
30. 18 MHz	F	18 MHz	F OSC coil until tone is heard
31. 18 MHz	F	18 MHz	F ANTENNA coil F RF coil
32. Repeat steps 28 through 31 until no further improvement is noticed.			

This completes the Alignment With Instruments. Proceed to the BFO Alignment.

BFO ALIGNMENT

Refer to Figure 6 for the following steps.

( ) Remove the cabinet top from the chassis.

( ) Set the controls and switches as follows:

BANDSPREAD—fully counterclockwise.
AF GAIN—OFF.
RF GAIN—fully clockwise.
RCV-STBY—RCV.
CAL—to position opposite CAL.
AM-CW/SSB—AM.
AVC-MVC—AVC.
ANL-OFF—OFF.
BAND—to Band B position.

( ) Make sure the speaker is connected to the chassis.

( ) Turn on the Receiver.

( ) Tune in a broadcast station with the TUNING control until a maximum reading is indicated on the meter.

( ) Place the AM-CW/SSB switch in the CW/SSB position. A loud tone or squeal should be heard from the speaker.

NOTE: Do not rotate the slug more than one turn in either direction when making the following alignment.

( ) Insert the alignment tool in the slug of BFO coil T401. Slowly rotate the alignment tool in one direction and listen for a decrease in pitch and volume of the tone. If the volume and pitch seem to increase, rotate the alignment tool in the opposite direction. Slowly rotate the alignment tool until the tone stops or sounds like an intermittent growl (zero beat).

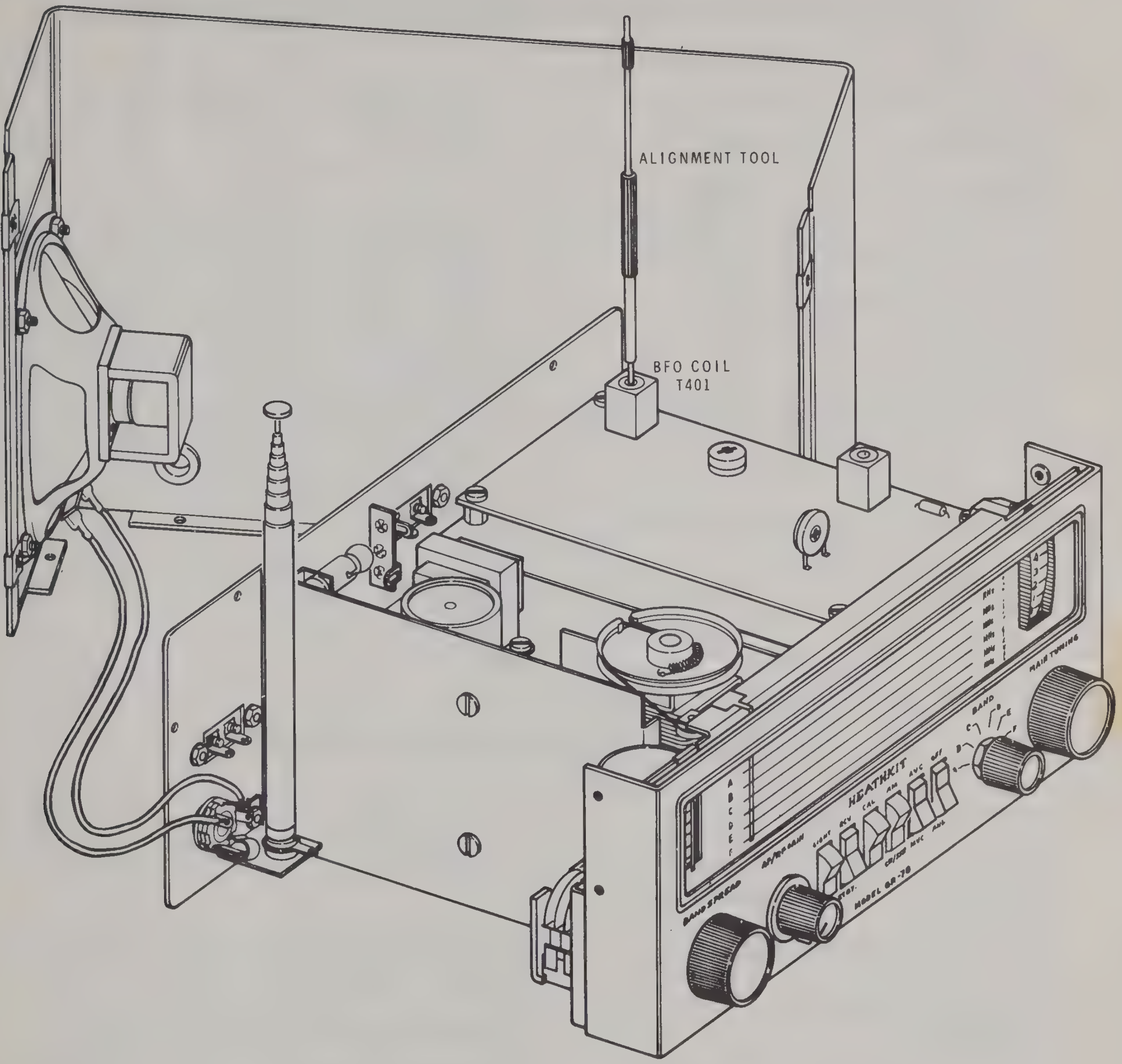

ALIGNMENT TOOL
BFO COIL
T401
HEATHKIT
MODEL GR-78
BAND SPREAD
MAIN TUNING
BAND

Figure 6

( ) Tune through the zero beat signal with the TUNING control. The tone should be equal on both sides of the zero beat.

( ) Place the AM-CW/SSB switch in the AM position. The growl should no longer be heard.

( ) Turn off the Receiver.

This completes the BFO Alignment. Proceed to the "500 kHz Crystal Calibration Alignment" on Page 82.

500 kHz CRYSTAL CALIBRATION ALIGNMENT

Refer to Figure 7 for the following steps.

( ) Set the controls and switches as follows:

BANDSPREAD–fully counterclockwise.
AF GAIN–OFF.
RF GAIN–fully clockwise.
RCV-STBY–RCV.
CAL–to position opposite CAL.
AM-CW/SSB–AM.
AVC-MVC–AVC.
ANL-OFF–ANL.
BAND–to the appropriate band to receive WWV at 2.5, 5, 10, 15, 20, or 25 MHz.

( ) Make sure the speaker is connected to the chassis.

( ) Turn on the Receiver.

( ) Tune to station WWV or WWVH on 5, 10, 15, or 20 MHz.

( ) Turn CAL switch to CAL.

( ) Adjust the ceramic trimmer capacitor on the Receiver circuit board with a nonmetallic screwdriver for a "zero beat" in the Receiver. The period when no tone modulation is present allows easier identification of the zero beat. Zero beat is the point at which a harmonic of 500 kHz corresponds to the frequency of the station tuned in on the Receiver. As the zero beat is approached, a tone that decreases in frequency until it finally stops will be heard from the Receiver. Set the CAL switch to the position opposite CAL and then back to CAL to be sure you have a true zero beat. Turn OFF the Receiver.

This completes the "500 kHz Crystal Calibration Alignment."

5.5 MHz TRAP COIL ALIGNMENT

( ) Set the controls and switches as follows:

ANTENNA–collapsed.
BANDSPREAD–fully counterclockwise.
AF GAIN–OFF.
RF GAIN–fully clockwise.
RCV-STBY–RCV.
CAL–to position opposite CAL.
AM-CW/SSB–AM.
AVC-MVC–AVC.
ANL-OFF–OFF.
BAND–D.

( ) Make sure the speaker is connected.

( ) Turn the Receiver on and tune slowly back-and-forth between 5 MHz and 6 MHz. If there is a noted rise in the meter indication around 5.5 MHz, proceed with the following steps. If there is no noted rise, turn OFF the Receiver and proceed to the "Final Assembly" section of the Manual.

Refer to the inset drawing on Figure 7 for the following steps.

( ) Remove the bottom shield from the Receiver.

( ) Adjust the 5.5 MHz trap coil for a null on the meter.

( ) Turn off the Receiver.

( ) Replace the bottom shield.

This completes the 5.5 MHz Trap Coil Alignment. Proceed to the "Final Assembly" section.

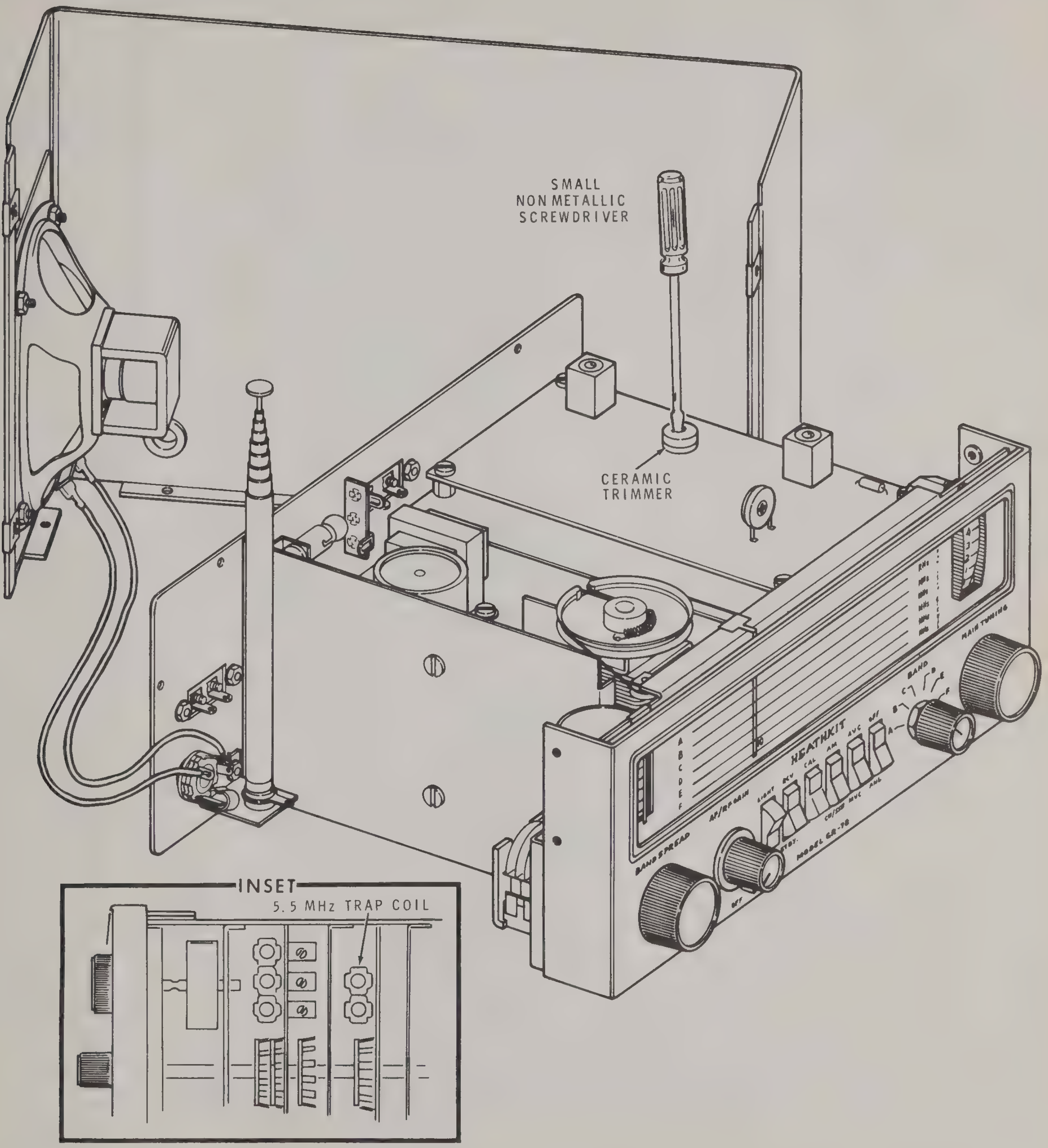

SMALL NONMETALLIC SCREWDRIVER
CERAMIC TRIMMER
HEATHKIT
MAIN TUNING
BAND
A
B
C
D
E
F
BAND SPREAD
AF/RF GAIN
OFF
LIGHT
RCV
CAL
AM
AVC
OFF
STBY.
CB/SSB
MVC
ANL
MODEL GR-78
INSET
5.5 MHz TRAP COIL

Figure 7

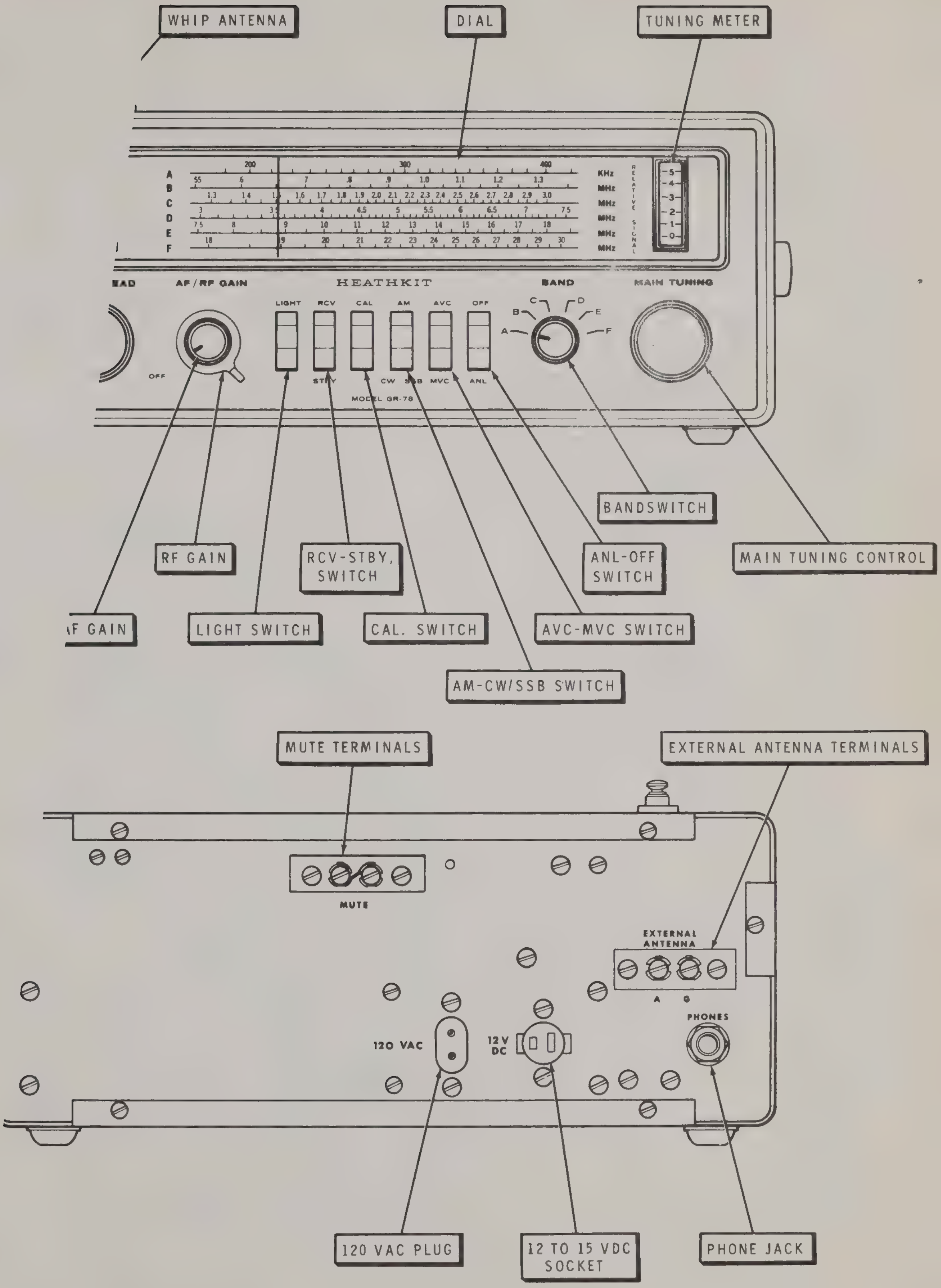

WHIP ANTENNA
DIAL
TUNING METER
A
B
C
D
E
F
KHz
MHz
RELATIVE SIGNAL
5
4
3
2
1
0
EAD
AF / RF GAIN
HEATHKIT
BAND
MAIN TUNING
OFF
LIGHT
RCV
CAL
AM
AVC
OFF
STBY
CW
SSB
MVC
ANL
MODEL GR-78
BANDSWITCH
RF GAIN
RCV-STBY, SWITCH
ANL-OFF SWITCH
MAIN TUNING CONTROL
F GAIN
LIGHT SWITCH
CAL. SWITCH
AVC-MVC SWITCH
AM-CW/SSB SWITCH
MUTE TERMINALS
EXTERNAL ANTENNA TERMINALS
MUTE
EXTERNAL ANTENNA
A
G
PHONES
120 VAC
12 V DC
120 VAC PLUG
12 TO 15 VDC SOCKET
PHONE JACK

FIGURE 8

FINAL ASSEMBLY

Refer to Pictorial 6-20 for the following steps.

( ) Carefully peel away the backing paper from the blue and white identification label. Then press the label onto the chassis in the position shown. Be sure to refer to the numbers on the label in any communications you have with the Heath Company about this kit.

( ) Cut each of the two fiber spacers into three equal strips. Remove the paper backing from the strips and press the three strips on each end of the bezel as shown.

( ) Install the bezel over the front panel with two 6-32 x 1/4" flat head screws in the lower holes of the bezel. Be careful not to scratch the bezel while completing the following steps.

( ) Position the cabinet top over the chassis as shown. Then set the cabinet top on the chassis. Install 6-32 x 5/16" screws through the cabinet top and into the top holes of the bezel. Be sure the speaker wires are connected to the speaker.

Refer to Pictorial 6-21 for the following steps.

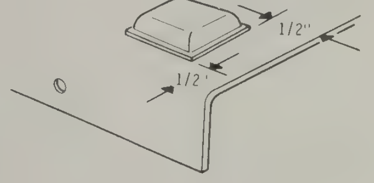
( ) Position the Receiver as shown.

( ) Mount the cabinet top to the rear panel with #6 x 1/4" sheet metal screws.

( ) Position the cabinet bottom as shown in the Pictorial.

( ) Position the Receiver in the cabinet bottom and make sure it is seated properly. Then mount the cabinet bottom to the cabinet top with four 6-32 x 1/4" screws.

( ) Finish mounting the cabinet bottom with two #6 x 1/4" sheet metal screws into the rear panel.

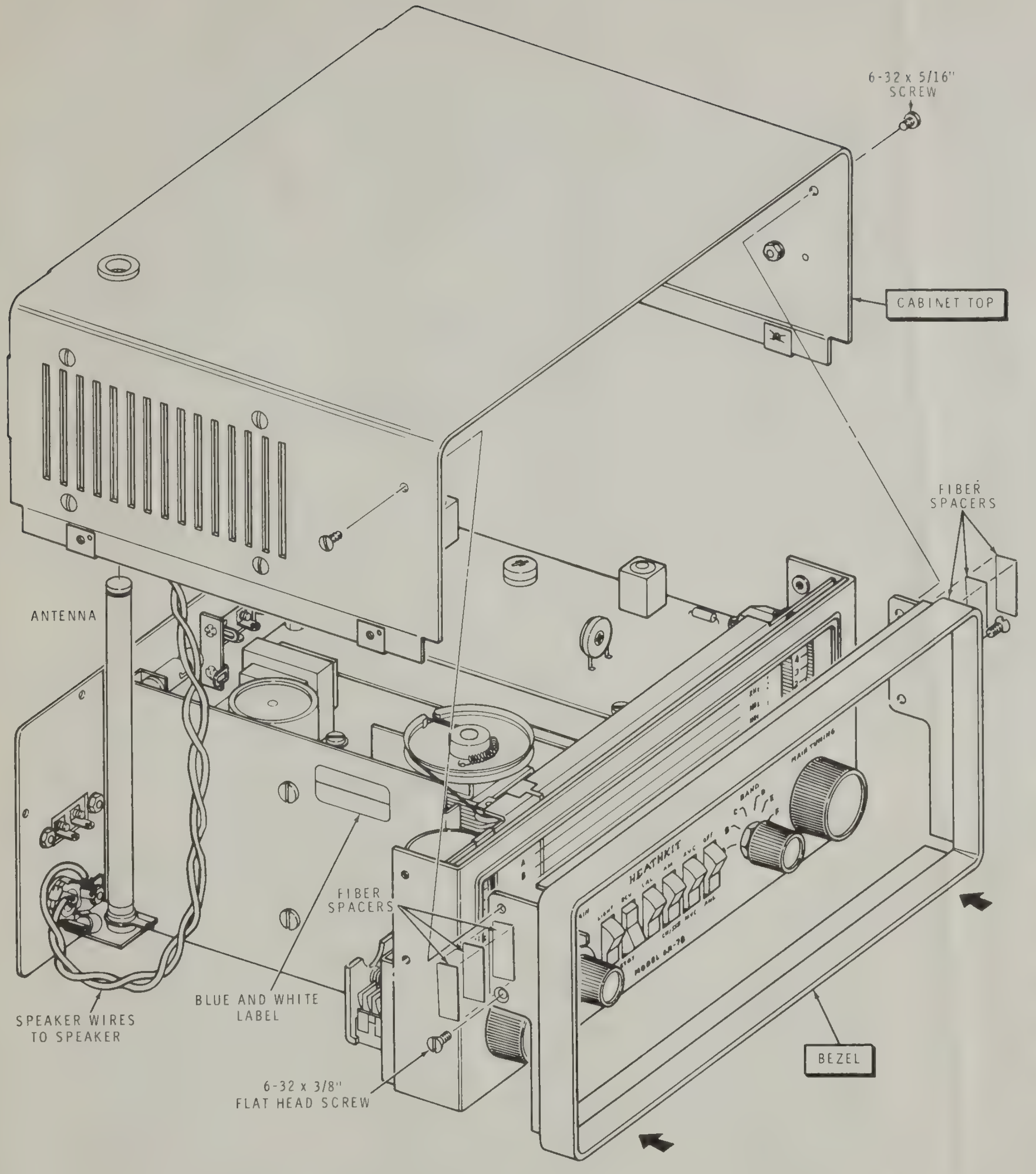


Detail 6-21A

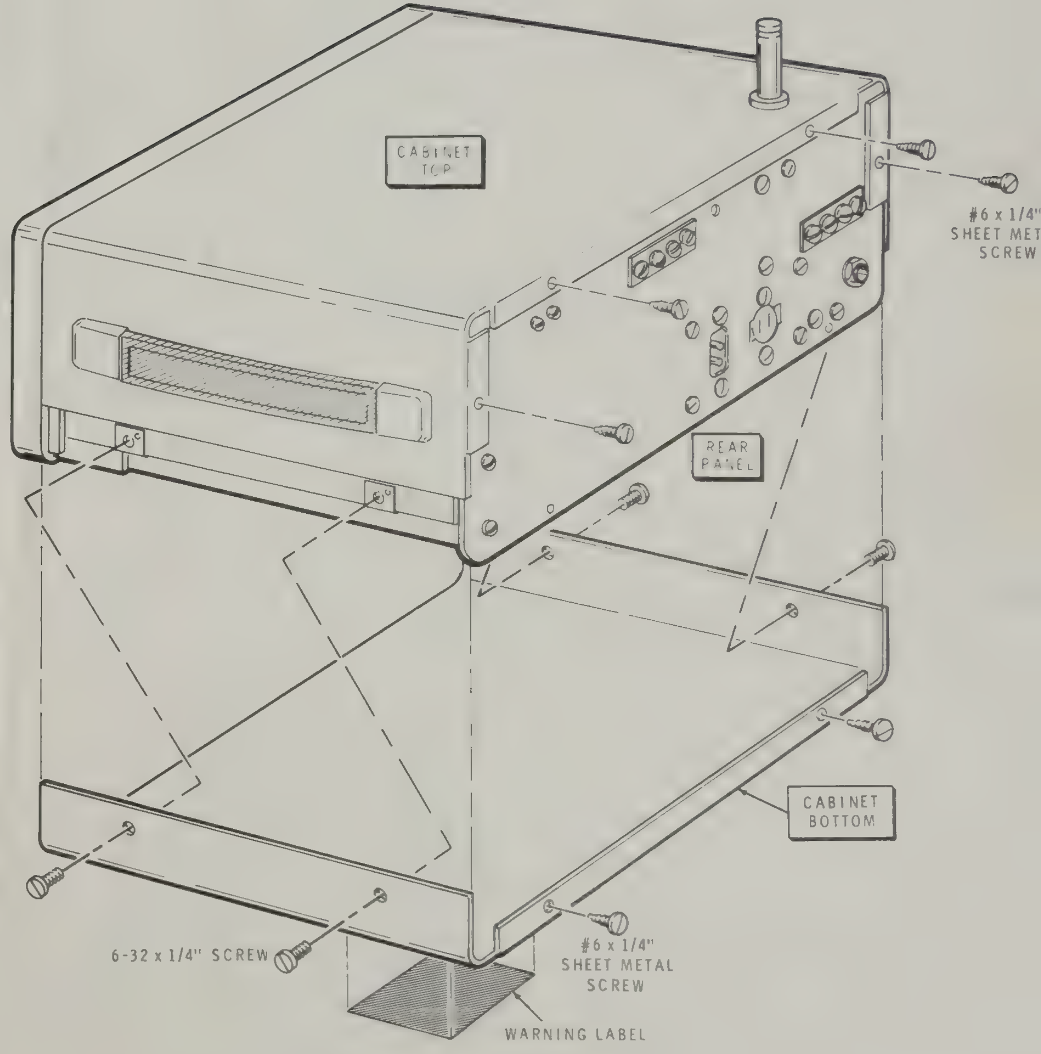
( ) Refer to Detail 6-21A and mount a foot at each corner on the bottom of the Receiver. Peel away the protective paper on each foot and stick it into place as shown.

( ) Remove the paper backing from the Warning label. Press the label onto the bottom of the cabinet bottom.

This completes the assembly of your General Coverage Receiver. Proceed to the "Operation" section of the Manual.


6-32 x 5/16" SCREW
CABINET TOP
FIBER SPACERS
ANTENNA
FIBER SPACERS
BLUE AND WHITE LABEL
SPEAKER WIRES TO SPEAKER
6-32 x 3/8" FLAT HEAD SCREW
BEZEL
HEATHKIT

PICTORIAL 6-20


CABINET TOP
#6 x 1/4" SHEET MET SCREW
REAR PANEL
CABINET BOTTOM
6-32 x 1/4" SCREW
#6 x 1/4" SHEET METAL SCREW
WARNING LABEL

PICTORIAL 6-21

OPERATION

Before attempting to use the Receiver, carefully read the front and rear panel explanations to learn the functions of each of the controls, switches, and connectors.

FRONT AND REAR PANEL CONTROLS AND SWITCHES

Refer to Figure 8 (fold-out from Page 86) and the following information for a description of control and switch functions.

AF GAIN—Turns the Receiver on or OFF. Varies the loudness of the sound from the speaker or headphones by controlling the amount of audio amplifier gain.

RF GAIN—Varies the loudness of the sound from the speaker or headphones by controlling the amount of RF amplifier gain. NOTE: It may be desirable to set this control toward full counterclockwise on strong SSB signals for best fidelity. Normally it will be set at or near its full clockwise position.

AM-CW/SSB—Selects the following types of reception: AM (amplitude modulation), SSB (single sideband) or CW (continuous wave).

BAND—Selects one of six frequency bands: A, B, C, D, E, or F.

MAIN TUNING—Tunes the Receiver to the desired station.

BANDSPREAD—A fine tuning adjustment that is used in conjunction with the Main Tuning to help separate close-together signals on crowded frequency bands. This control is normally left in fully CCW position when not in use, since it affects the main dial calibration. To use the calibrated BANDSPREAD, set the MAIN TUNING dial to one of the frequencies shown on the right side of the bandspread scale. Now tune with the Bandspread for expanded frequency coverage. It will seldom be necessary to use this control on Bands A and B.

AVC/MVC—Automatic Volume Control. The AVC circuit automatically adjusts the volume level to compensate for changes in signal strength. It also reduces the effect of "blasting" when a strong signal is tuned in. Leave this switch in the AVC position except when listening to very weak stations and then the MVC position should be used. This will allow manual volume control of the RF stage. Distortion will occur, however, if a strong station is received when the AF Gain control is fully clockwise.

ANL-OFF—Automatic Noise Limiter. Limits static and ignition noise when in the ANL position. Turn this switch to ANL only when noise limiter action is desired. When a strong signal is tuned in, turn the switch to OFF to prevent distortion.

RCV/STBY—This switch has two positions; RCV (receive) and STBY (standby). For normal Receiver operation, use the RCV position. To keep the Receiver ready for instant use, switch to the STBY position.

TUNING METER—Provides meter indication for precise signal tuning. AVC-MVC switch must be set to the AVC position to allow this meter to be used. For maximum meter deflection the RF GAIN must be in the full clockwise position.

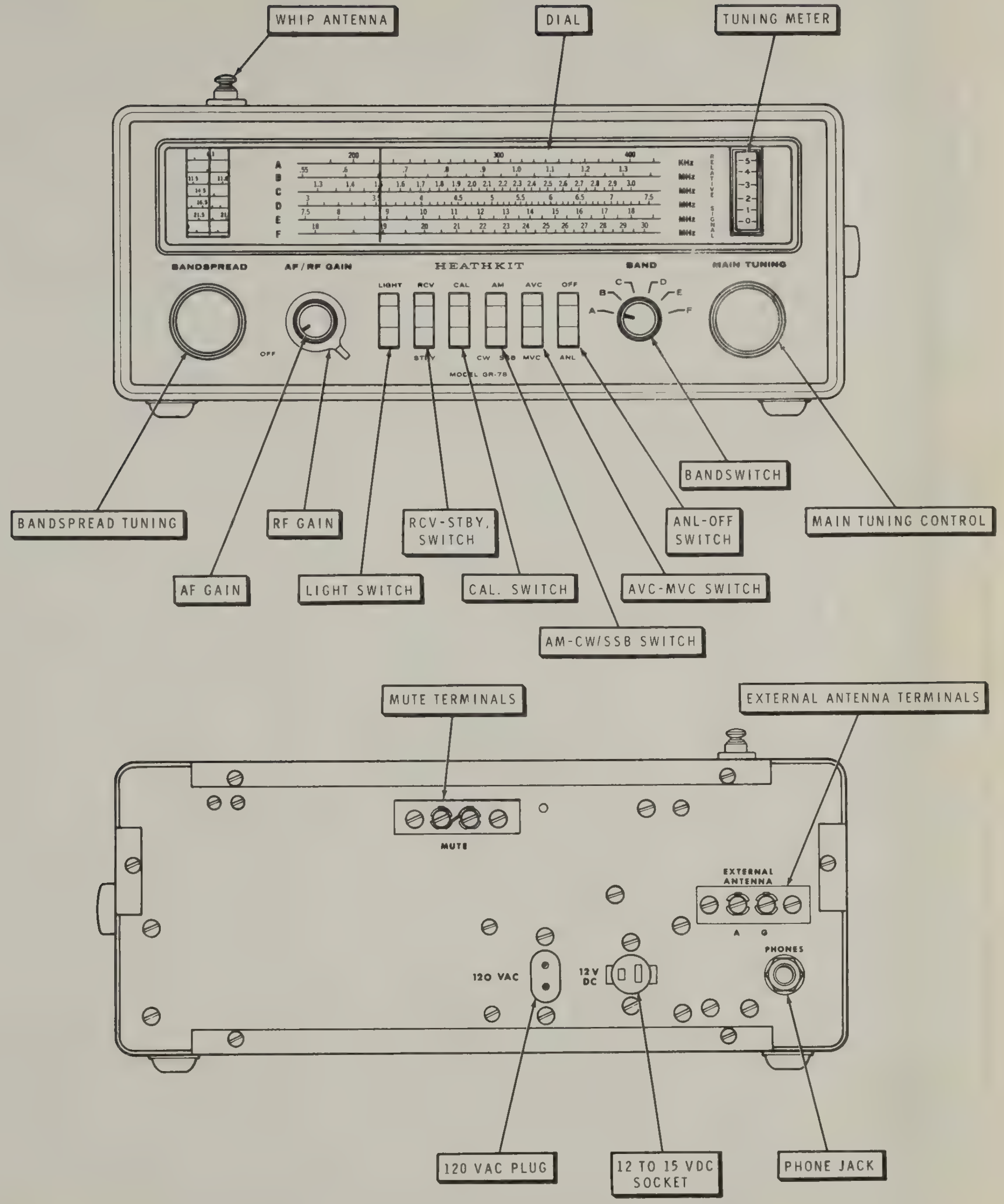

WHIP ANTENNA
DIAL
TUNING METER
HEATHKIT
BANDSPREAD
AF/RF GAIN
BAND
MAIN TUNING
LIGHT
RCV
CAL
AM
AVC
OFF
STBY
CW
SSB
MVC
ANL
MODEL GR-78
A
B
C
D
E
F
BANDSWITCH
BANDSPREAD TUNING
RF GAIN
RCV-STBY, SWITCH
ANL-OFF SWITCH
MAIN TUNING CONTROL
AF GAIN
LIGHT SWITCH
CAL. SWITCH
AVC-MVC SWITCH
AM-CW/SSB SWITCH
MUTE TERMINALS
EXTERNAL ANTENNA TERMINALS
MUTE
EXTERNAL ANTENNA
A
G
PHONES
120 VAC
12V DC
120 VAC PLUG
12 TO 15 VDC SOCKET
PHONE JACK

FIGURE 8

OPERATION

Before attempting to use the Receiver, carefully read the front and rear panel explanations to learn the functions of each of the controls, switches, and connectors.

FRONT AND REAR PANEL CONTROLS AND SWITCHES

Refer to Figure 8 (fold-out from Page 86) and the following information for a description of control and switch functions.

AF GAIN—Turns the Receiver on or OFF. Varies the loudness of the sound from the speaker or headphones by controlling the amount of audio amplifier gain.

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BAND—Selects one of six frequency bands: A, B, C, D, E, or F.

MAIN TUNING—Tunes the Receiver to the desired station.

BANDSPREAD—A fine tuning adjustment that is used in conjunction with the Main Tuning to help separate close-together signals on crowded frequency bands. This control is normally left in fully CCW position when not in use, since it affects the main dial calibration. To use the calibrated BANDSPREAD, set the MAIN TUNING dial to one of the frequencies shown on the right side of the bandspread scale. Now tune with the Bandspread for expanded frequency coverage. It will seldom be necessary to use this control on Bands A and B.

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RCV/STBY—This switch has two positions; RCV (receive) and STBY (standby). For normal Receiver operation, use the RCV position. To keep the Receiver ready for instant use, switch to the STBY position.

TUNING METER—Provides meter indication for precise signal tuning. AVC-MVC switch must be set to the AVC position to allow this meter to be used. For maximum meter deflection the RF GAIN must be in the full clockwise position.

CAL—The calibrate switch turns on a 500 kHz crystal oscillator which provides calibrate signals every 500 kHz along the dial.

LIGHT SWITCH—A spring return switch that turns on the panel lamps. Returns to off by spring action to coconserve battery power.

120 VAC Socket—Provides for connection to 120 VAC charging source (or 240 VAC, depending on how the Receiver is wired).

12 VDC Socket-Provides for connection for 12 to 15 VDC charging source.

PHONE JACK—For headphones or external speaker. The speaker is automatically disconnected when phone plug is inserted.

TUNING AM SIGNALS

The Receiver controls should be set as follows:

AF GAIN—On (turn clockwise to a comfortable listening level).
AM-CW/SSB—AM.
BAND SWITCH—Desired band.
RF GAIN—Full on (clockwise).
ANL-OFF—OFF (unless excess noise is present).
AVC-MVC—AVC (unless copying a weak signal).

Tune the signal to peak the reading on the tuning meter, then adjust AF GAIN control for desired output level. If the signal is extremely strong, turn the RF GAIN control counterclockwise to reduce possible distortion.

TUNING SSB OR CW SIGNALS

The Receiver controls should be set as follows:

AF GAIN—On (turn clockwise to a comfortable listening level).
AM-CW/SSB—CW/SSB.
BAND SWITCH—Desired band.
RF GAIN—Fully clockwise.
ANL-OFF—OFF (unless excessive noise is present).
AVC-MVC—AVC (unless copying a weak signal).

Tune in a SSB signal. The signal will have a "quacking" sound to it. Tuning these signals will require practice due to the narrow bandwidth of the signals. Very slow tuning is required, and the RF Gain may also have to be adjusted when listening to a strong station.

FIXED STATION RECEIVER

When using this Receiver with a transmitter, the muting terminals on the rear of the chassis should be used. These terminals are in the B+ lead to the audio preamplifier.

Using an external switch or a relay, the terminals 1 and 2 of the muting terminals should be open (disconnected) during the transmit period and closed (connected) during the receive period. The jumper wire used in normal operation must be removed for this type of operation.

In using this Receiver as the station receiver in close proximity to a transmitter, it is desirable to short the External Antenna terminal to ground during transmit conditions. Otherwise excessive signal to the"front end" of the Receiver may cause failure of the RF amplifier transistor.

You may notice a slight hum when the Receiver is turned on and the AC line cord is plugged in. This hum can be eliminated by disconnecting the line cord.

BATTERY LIFE AND RECHARGING

The Receiver operates from an internal rechargeable nickel-cadmium battery. The battery can be charged from 120 VAC, 240 VAC, or 12 to 15 VDC. Separate power cords are supplied for AC or DC charging voltages and each cord has a separate power socket on the rear panel. Only one power cord should be connected at a time. When either power cord is used, the battery is always being trickle charged when the Receiver is OFF. This keeps the battery fully charged.

Battery life can be extended if you use the dial lamp only when necessary, and then only briefly. To check for a weak battery, tune to a radio station of moderate strength. Then, while watching the TUNING meter, press the LIGHT switch. If the meter needle drops more than 1/8", the battery needs recharging.

Depending on the charging voltage, the battery is always being charged at 20 to 25 mA when the built-in trickle charging circuit is connected to 120 VAC, 240 VAC, or 12 to 15 VDC with the front panel switch OFF. At this charge rate, a full battery charge will be maintained if the Receiver is used an average of 8 hours daily at a normal listening level. If the Receiver will not be used for 30 days or more, disconnect the external power source.

The battery is electrically divided in half for charging from AC. When the AC power cord is plugged into a power outlet, the AC voltage from the secondary of transformer T501 is applied through diode D501 on one-half cycle to charge one-half of the battery. On the other half cycle, the voltage is applied through diode D502 to charge the other half of the battery.

The battery can also be charged from 12 to 15 VDC. When the DC power cord is connected to a power source, the DC voltage is applied through diode D503, pilot lamp PL-503 and resistor R503 to the battery. The diode protects the battery from being discharged in case the external DC charging voltage is connected backwards. The pilot lamp (seen through the small hole in the rear panel) and resistor function primarily as a DC charging current limiter. The lamp may not necessarily be lit.

Charging From an AC Power Source

Plug the AC power cord into a 120 VAC or 240 VAC power outlet depending how the Receiver was wired. The battery will charge automatically as long as the power cord is plugged in and the Receiver is turned off. If the battery was completely run down (approximately 9.0 volts), this process takes about 36 hours. If it was not completely run down, approximately 1-1/2 hours of charging for each hour the battery was used since the last charge will restore the battery to full charge. However the battery should be recharged occasionally for a period of 24 hours to insure that all the cells of the battery reach full charge. The battery can be trickle charged for several days without being harmed. A full charge can be accomplished only if the Receiver is turned off.

Charging From a DC Power Source

CAUTION: If the Receiver is connected to a 12 to 15 VDC POSITIVE GROUND power source, the Receiver chassis must not touch the chassis or ground side of the power source.

Connect the DC power cord to a 12 to 15 VDC power source. When the front panel switch is OFF the battery will charge automatically at the given rate as long as the power cord is connected to the power source. Depending on the type of power source; such as a storage battery, or a car or boat generator; the charging voltage can vary from 12 VDC to 15 VDC. If the battery was completely run down (approximately 9.0 volts), this process takes from 30 hours for a 13.5 VDC power source to 20 hours for a 15 VDC power source. If it was not completely run down, approximately 1-1/2 hours of charging for each hour the battery was used since the last charge will restore the battery to full charge. However, the battery should be fully recharged occasionally for approximately 24 hours to insure that all the cells of the battery reach full charge. The battery can be trickle charged for 30 days without being harmed. The front panel switch must be OFF to accomplish a full charge in the above given times.

VOLTAGE	CHARGING RATE
12 VDC	15 mA
13.5 VDC	25 mA
15 VDC	35 mA

ANTENNA INSTALLATION

An external antenna and a ground system are necessary for good longwave reception on Band A and good shortwave reception on Bands C, D, E, and F. The antenna will also greatly improve reception on Bands B and C, the standard broadcast bands.

The following information includes three types of antennas: long-wire, dipole, and inverted-V dipole. Read the information concerning each antenna and then follow the installation instructions for the one that best suits your needs. The Heathkit Model GRA-72 SWL Receiving Antenna would make an adequate long-wire, dipole, or inverted-V antenna.

Antenna Types

Dipole–This is a directional antenna designed for shortwave reception. The directional feature means that signals are received best when the antenna is turned broadside to the transmitting station (when the ends of the antenna do not point toward the transmitting station).

Inverted-V Dipole–This is a nondirectional antenna designed for shortwave reception. The nondirectional feature means that this antenna will receive signals equally well from all directions. Therefore, it is often possible to receive more stations with this antenna than you would with the straight dipole antenna.

Dipole or Inverted–V Dipole Installation

An antenna 100 feet long will give good reception from 3 to 15 megahertz, with the best reception being near 5 megahertz. Use the following formula if you want to compute the length of an antenna that will have its best reception at another frequency.

$$\text{length (feet)} = \frac{468}{\text{frequency (megahertz)}}$$

The following material is needed for this antenna installation:

Antenna — A length of bare wire. NOTE: The length of wire should be slightly longer to allow for fastening to the insulators. The finished antenna length should be exactly as per the formula.

Lead-in — RG-58AU or RG-174U coaxial cable. The length depends upon the height of your antenna and the location of your Receiver.

Ground wire — Same type as antenna wire. The length depends upon the distance between the Receiver and the grounding surface.

Insulators — Three ceramic or glass, approximately 2-1/2" long.

Ground rod — One 6 or 8 foot length, 3/8" diameter. NOTE: A ground rod is not needed if an alternate ground, such as a cold water pipe in your house is used.

Clamp — One for ground rod.

Lightning arrester — One for lead-in cable.

NOTE: For dipole installation, refer to steps 1A through 12.

For inverted - V dipole, refer to steps 1B through 12.

1A. Locate two supports that are fairly high from the ground and 50 to 100 feet apart. One support could be your house and the other a pole. A dipole antenna can be suspended between the two supports as shown in Figure 9.

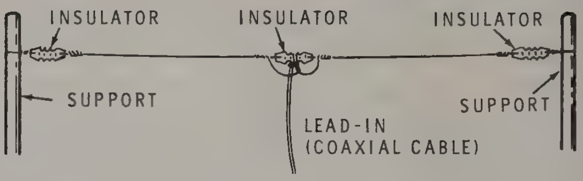

Figure 9

1B. Locate three supports that are fairly high off the ground. The center support should be 20 to 100 feet from the ground and both end supports over 10 feet from the ground. Note that the angle between the center support and the antenna wires should be over 45 degrees. An inverted - V antenna can be suspended between the three supports as shown in Figure 10.

2. Cut the antenna wire in half. Fasten one end of one wire to an insulator. Then fasten one end of the other wire to the other end of the same insulator.

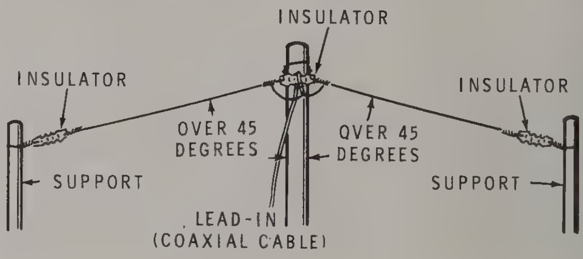

Figure 10

3. Fasten the remaining two insulators to the ends of the antenna wire.

4. Prepare one end of the lead-in cable so that you will have a 3" center lead and a 3" shield lead.

5. Refer to Figure 11 and fasten the prepared end of the cable to the center insulator (for support). Then solder the center lead of the cable to the antenna wire on one side of the insulator. Solder the shield to the antenna wire on the other side of the insulator.

6. Use this step for inverted - V dipole only. Fasten the insulator just prepared to the center support.

7. Fasten an insulator to each end support.

8. Route the lead-in wire into the house at your Receiver location.

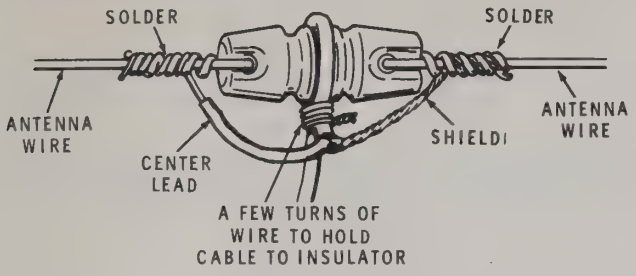

Figure 11

9. Prepare the end of the lead-in and connect it to the EXTERNAL ANTENNA terminals on the back of the Receiver: Connect the center lead to the A terminal and the shield lead to the G terminal.

10. Drive the ground rod into the ground leaving about 6" sticking up above the soil. Pick a convenient location as close as possible to the Receiver. This will enable you to keep the ground wire that will be installed in the following step, as short as possible.

11. Attach a wire from EXTERNAL ANTENNA terminal G to the clamp on the ground rod.

12. Follow the instructions that come with the lightning arrester and fasten it to the lead-in cable and ground.

RECEPTION GUIDE

BAND	FREQUENCY	TIME	ZONE
80 M	3.5 MHz	Morning, evening	Local (Amateur)
49 M	6 MHz	Evening	Latin America and Europe
41 M	7 MHz	Evening	Europe
40 M	7 MHz	Late afternoon, Evening	Europe
40 M	7 MHz	Morning	United States (Amateur)
31 M	9 MHz	Morning	Asia and Australia
31 M	9 MHz	Afternoon	Europe and Africa
31 M	9 MHz	Evening	Europe and Latin America
25 M	11 MHz	Morning	Asia and Australia
25 M	11 MHz	Evening	Latin America
20 M	14 MHz	Late morning, afternoon	United States, Foreign, (Amateur)
19 M	15 MHz	Late morning, afternoon	Europe and North America
19 M	15 MHz	Evening	North and Latin America
16 M	17 MHz	Afternoon	Europe
	17 MHz	All day	United States
	17 MHz	Evening	South America
13 M	20 MHz	Afternoon	Europe
	20 MHz	All day	United States
	20 MHz	Evening	South America
11 M	27 MHz	All day	Local (Citizen's Band)
10 M	28 MHz	Morning	Europe
	28 MHz	Evening	Central America, United States (Amateur), Asia

These reception conditions prevail in the spring and fall of the year. They are also subject to varying atmospheric conditions, sunspot activities, and to some extent, weather conditions. In the winter, reception generally will be best on the lower frequency bands. In summer, reception will be better on higher frequency bands. In addition to the above information, you will find the Heathkit Logs And Charts book, included with your Kit, helpful in locating stations. NOTE: Your Receiver will not receive all of the stations included in the book. The book has been provided only as a reference.

IN CASE OF DIFFICULTY

This section of the Manual is divided into two parts. The first part, titled General Troubleshooting Information, describes what to do about any difficulties that may occur right after the Receiver is assembled. The second part, a Troubleshooting Chart, lists a number of possible difficulties that could arise, and lists several possible causes.

Before starting any troubleshooting procedure, try to narrow the problem down to a specific area by trying the various functions of the Receiver.

GENERAL TROUBLESHOOTING INFORMATION

The following paragraphs deal with the types of difficulties that may show up right after a kit is assembled. These difficulties are most likely to be caused by assembly errors or faulty soldering. These checks will help you locate any error of this type that might have been made.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of the Manual. Your Warranty is located inside the front cover.

1. Recheck the wiring. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the builder.
2. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the soldering section of the Kit Builders Guide.
3. Check the values of the parts. Be sure that the proper parts have been wired into each circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.
4. Check for bits of solder, wire ends, or other foreign matter which may be lodged in the wiring.
5. Check for solder bridges between circuit board foils.
6. If, after careful checks, the trouble is still not located and a voltmeter is available, check the voltages in the circuits of your General Coverage Receiver against those shown on the Voltage Charts (Pages 103, 104, and 105) and Schematic (fold-out from Page 117). NOTE: All voltage readings were taken with an 11 megohm input voltmeter. Voltages may vary as much as ±20%.
7. A review of the Circuit Description and a study of the Schematic Diagram may also help you locate a difficulty in the Receiver. Refer to the X-Ray Views of the circuit boards on Page 101 to help locate parts.

TROUBLESHOOTING CHART

DIFFICULTY	POSSIBLE CAUSE
Initial resistance check shows short circuit.	1. Trimmers installed upside down. 2. Power supply B+ circuit shorted to ground. 3. Solder bridge between foils on circuit board. 4. Trimmer capacitors shorted to adjacent foils.
Receiver dead.	1. Shorting springs not removed from Q101, Q201, or Q401. 2. Dead battery, requires charging. 3. Shorted B+ circuit. 4. Mute jumper not connected. 5. RCV/STBY switch in STBY position.
Low sensitivity.	1. Low battery voltage, requires charging. 2. Receiver misaligned. 3. Trimmer capacitors shorted to adjacent foils. 4. Transistors Q101, Q201, Q301, Q401, and/or Q405 installed incorrectly.
Sound distorted.	1. Low battery voltage. 2. Received signal distorted. 3. AF or RF gain controls set too high. 4. Transistors Q408 or Q409.
Distortion on strong stations.	1. See "Sound distorted." 2. AVC switch in MVC position. 3. Too close to station.
Noisy when tuning or dead at one end on all bands.	1. Tuning capacitor plates bent or dirty.
Single-sideband signals sound low or high pitched.	1. Signal not tuned in properly. 2. Transformer T401 not aligned properly.
A low howl from the speaker on strong stations, especially on Bands E and F.	1. Flat braid connected to tuning capacitor not flexible. 2. Lead from bandspread capacitor to tuning capacitor too long.
Tuning meter inoperative.	1. AVC switch in MVC position. 2. Resistor R408 misadjusted. 3. Meter.
Dim panel lights.	1. Low battery voltage. 2. Resistor R504 wrong value.

SPECIFICATIONS

Frequency Coverage . . . .
Band A: 200 kHz to 400 kHz
Band B: 550 kHz to 1300 kHz
Band C: 1.3 MHz to 3.0 MHz
Band D: 3.0 MHz to 7.5 MHz
Band E: 7.5 MHz to 18.0 MHz
Band F: 18.0 MHz to 30 MHz

Meter . . . . Indicates relative signal strength

Intermediate Frequency . . . .
Band A through E: 455 kHz
Band F: 455 kHz and 4034 kHz

Sensitivity* . . . .

	AM		CW/SSB	
	Low End	High End	Low End	High End
Band A:	10 µv	3 µv	6 µv	2 µv
Band B:	3	1	2	.7
Band C:	3	.6	1.5	.4
Band D:	2	.3	2	.2
Band E:	3	.2	3	.2
Band F:	2	.3	2	.2

Image Rejection . . . .

Band A	65 dB or more
Band B	60 dB or more
Band C	48 dB or more
Band D	35 dB or more
Band E	25 dB or more
Band F	35 dB or more

Selectivity . . . . 7±1 kHz wide, 6 dB down

Audio Output . . . . 300 milliwatts

Crystal Calibrator . . . . 500 kHz

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*Signal level for 10 dB signal-plus-noise to noise ratio.

Battery Charge Rate	The battery is always being charged at 20 to 25 mA when the built-in trickle charging circuit is connected to an external power source with the Receiver turned off. A full battery charge will be maintained if the Receiver is connected to an external power source and used an average of 8 hours daily at a normal listening level.

VOLTAGE	CHARGE RATE
120/240 VAC	22 mA
12 VDC	15 mA
13.5 VDC	25 mA
15 VDC	35 mA

Battery Drain	65 mA at 50 mW audio output level. 40 mA at no audio output. When the Receiver is not connected to an external power source, battery life at full charge is approximately 8 hours at a normal listening level.
Panel Controls	Bandspread AF Gain-Off RF Gain Panel light RCV-STBY CAL AM-CW/SSB AVC-MVC ANL-OFF Bandswitch Main Tuning
Rear Panel	Muting External Antenna 12 VDC Receptacle 120 VAC Receptacle Phone Jack
Weight	10 lbs.
Overall Size	6-1/4" high x 11-1/2" wide x 9" deep

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

4,034
3,579
.455 kHz

CIRCUIT DESCRIPTION

Refer to the Block Diagram (fold-out from Page 99) and to the Schematic Diagram (fold-out from Page 117) while reading this description. The Bandswitch will be considered to be in Band A position.

RF AMPLIFIER

The RF signals received from the built-in whip antenna, or external antenna, are coupled to the input tuned circuit for Band A. This tuned circuit consists of antenna coil L1, trimmer capacitor C1, and the first section of tuning capacitor C501A. The input signal is then coupled from a tap on coil L1 to gate 1 of field effect transistor Q101. Bias voltage for Q101 is obtained from the AVC amplifier and is applied to gate 2. Source resistor R103 and RF Gain control R501 provide the proper drain current for normal operation (with R501 fully clockwise). Turning the RF Gain control changes the amount of current flowing, thereby varying the gain. The amplified signal from Q101 is fed to a tap on RF coil L101, which along with trimmer capacitor C101 and tuning capacitor C501B form the input tuned circuit of first mixer stage Q201.

FIRST MIXER

Transistor Q201 is a dual-gate silicon field effect transistor (FET). The mixer features excellent freedom from cross modulation or overloading and oscillator "pulling" on strong signals. The amplified signal from Q101 is applied to gate 1 of Q201 through capacitor C111. The local oscillator signal from Q301 is applied to gate 2 of Q201, which is biased by resistors R203 and R204. Source resistor R205 establishes the DC operating point. The incoming signal and the oscillator signal are heterodyned (mixed) in Q201, resulting in the IF frequency and mixer products. On Bands A through E, the output of Q201 is fed to a tap on coil L201 which resonates with capacitor C201 to provide a 455 kHz output signal. On Band F, the output from Q201 is fed to coil L202, which resonates with capacitor C202 to provide a 4.034 MHz output signal.

SECOND MIXER/IF AMP

The output from the first mixer, Q201, is coupled through capacitor C205 to gate 1 of field effect transistor Q401, which operates as an IF amplifier on Bands A through E and as a mixer providing double conversion on Band F. Operating bias is provided on gate 2 by resistors R401 and R402. When the bandswitch is in Band F position, a 3.579 MHz injection signal from Conversion Oscillator Q411 is applied to gate 2 of Q401. This signal combines with the 4.034 MHz signal from the first mixer, Q201, and results in an output signal of 455 kHz plus the mixer product frequencies. This output signal is coupled through capacitor C410 to ceramic passband filters FL401 through FL404. These filters shape the passband and attenuate all frequencies, except the IF frequency of 455 kHz. This IF signal is coupled to the base of the first IF Amplifier stage, Q402.

Bias for Q402 is obtained from a voltage divider network, consisting of resistors R415 and R418. Resistor R431 supplies an AVC (automatic volume control) voltage from the AVC Amplifier, Q404, which corresponds to changes in the incoming signal strength.

IF amplifier stage Q402 also contains the circuit for the relative signal strength meter. The meter is connected between the emitter of Q402 and the meter zero adjust control R408. Control R408 is connected to a positive DC supply voltage, and it can be adjusted to give a zero indication on the meter. When the average level of the incoming RF signal increases, the AVC voltage decreases, causing the positive voltage at the base of transistor Q402 to decrease. This causes the current flowing through Q402 to decrease and causes a corresponding voltage drop across the emitter resistor R417. This varying voltage is read on the meter, which monitors AVC action and provides a visual method of indicating relative signal strength.

The amplified IF signal from Q402 is coupled through capacitor C415 to the base of second IF Amplifier Q403. Base bias for Q403 is obtained by a voltage divider consisting of resistors R419 and R421. Transistor Q403 is stabilized by emitter resistor R422 which is bypassed by capacitor C416 to ground. The amplified output of Q403 is applied across the collector load resistor R426 and is coupled through capacitor C418 to the following stages.

LOCAL OSCILLATOR

The local oscillator, Q301, is a single-gate silicon field effect transistor (FET). The oscillator tuned circuit consists of coil L301, trimmer capacitor C301 and tuning capacitor C501C. Oscillator injection voltage is coupled through capacitor C308 to gate 2 of mixer Q201. This Hartley oscillator is designed to operate 455 kHz higher in frequency than the received radio signal on Bands A, B, C, and D, 455 kHz lower in frequency on Band E; and 4.034 MHz higher on Band F.

AVC AMPLIFIER

A portion of the amplified signal from transistor Q403 is coupled through capacitor C421 to the base of the AVC (automatic volume control) Amplifier C404. This signal is rectified by the base-emitter portion of Q404 and a positive voltage drop is developed across the load resistor R432. This voltage causes a collector current to flow and a resultant drop in collector voltage that corresponds to the changes in signal strength. This varying DC voltage is applied as bias to IF Amplifier Q402, thereby controlling its gain.

A portion of the amplified signal from IF Amplifier Q403 is also coupled through capacitor C419 to diodes D403 and D404. These two diodes form a voltage doubler circuit which provides AVC voltage for RF amplifier Q101. Resistors R423, R424, and R425 establish the correct forward bias point for gate 2 of field effect transistor Q101 under no signal conditions. When a signal is received, the bias changes from a positive voltage, through zero, to a negative voltage. This voltage varies, depending upon the signal strength. Resistor R505 and capacitor C511 form an AVC timing circuit.

DETECTORS

A portion of the output signal from IF amplifier Q403 is applied to AM detector D401 for AM operation. This output signal is also applied through capacitor C429 to gate 1 of product detector Q405 for CW (continuous wave), or SSB (single sideband) reception. Q405 is a dual-gate silicon field effect transistor (FET) which exhibits excellent isolation between gate 1 and gate 2, eliminating BFO oscillator "pulling" or overloading on very strong signals. Gate 2 of transistor Q405 is biased by a voltage divider consisting of resistors R433 and R434.

Injection voltage from BFO oscillator Q410 is applied to gate 2 of product detector Q405 when the front panel switch is in the CW/SSB position. The IF signal and the BFO signal are combined (mixed) in the transistor. The resultant output is an audio signal that is developed across resistor R441 and coupled through capacitor C433 to the AM-CW/SSB switch SW503B.

BFO

Transistor Q410 is a Colpitts oscillator which is extremely stable over wide ranges of temperature. Capacitors C425 and C426 provide the proper feedback for oscillation and form a tuned circuit with T401 to resonate at 455 kHz. Resistors R437 and R438 form a voltage divider and apply DC biasing to the base of Q410. Emitter resistor R436 provides temperature stabilization for the transistor. Injection voltage is coupled to gate 2 of product detector Q405, through capacitor C424. The BFO is actuated by the AM-CW/SSB switch in the CW/SSB position. This switch applies DC operating voltage to the circuit through RFC 403.

CONVERSION OSCILLATOR

Transistor Q411 and its associated circuitry form the 3.579 MHz heterodyne oscillator, which is used to provide double conversion on Band F only. Injection voltage is coupled through capacitor C407 to gate 2 of Q401 which is operated as a mixer on Band F only.

ANL

The detected audio is connected from the AM-CW/SSB switch to the AF Gain control R505 by one of two paths, depending upon the position of ANL (automatic noise limiter) switch SW506. When the ANL switch is in the OFF position, the audio signal is routed through capacitor C436 to capacitor C439 which is connected to the AF Gain control. When the ANL switch is in the ANL position, the audio signal is routed through the automatic noise limiter circuitry instead of capacitor C436.

The detected audio signal is prevented from flowing through resistors R445 and R446. These two resistors, along with capacitor C438, form an audio filter that stops the audio signal, but allows a small DC voltage to pass through. This small DC voltage biases the cathode of diode D402. The audio signal then passes through resistor R444, diode D402, and capacitor C439 to AF GAIN control R505. The diode clips the peaks of the audio signal, thus limiting noise spikes.

AUDIO AMPLIFIER

The aduio signal from AF Gain control R505 is coupled through capacitor C441 to the base of audio preamplifier transistor Q406. Resistors R449 and R451 form a voltage divider to provide the correct bias to Q406. DC operating bias is obtained from the RCV/STBY switch through resistor R449. The audio output from Q406 is developed across the load resistor R454 and direct coupled to the second audio driver transistor Q407.

The output of Q407 is also direct coupled to the audio output transistors Q408 and Q409, which operate as a complementary pair. Bias voltage for the output transistors is obtained from resistors R455 and R456. Audio output is coupled from the emitter resistors R457 and R458 through capacitor C446 to the 16 ohm speaker or headphone jack. A portion of the output is fed back to the emitter of preamplifier Q406 through resistor R453 and capacitor C444 to aid stabilization and minimize distortion.

CRYSTAL CALIBRATOR

Transistor Q412, crystal Y1, and the associated circuitry form a 500 kHz calibration oscillator which is switched on by the front panel Cal switch, SW504. This 500 kHz oscillator provides accurate calibration markings every 500 kHz for dial calibration.

CHARGING CIRCUIT

The battery is electrically divided in half for charging from AC. When the AC power cord is plugged into a power outlet, the AC voltage from the secondary of transformer T501 is applied through diode D501 on one-half cycle to charge one-half of the battery. On the other half cycle the voltage is applied through diode D502 to charge the other half of the battery.

The battery can also be charged from 12 to 15 VDC. When the DC power cord is connected to a power source, the DC voltage is applied through diode D503, pilot lamp PL-502, and resistor R503 to the battery. The diode protects the battery from being discharged in case the external DC charging voltage is connected backwards. The pilot lamp and resistor function primarily as a DC charging current limiter. The lamp may not necessarily be lit.

The amplified IF signal from Q402 is coupled through capacitor C415 to the base of second IF Amplifier Q403. Base bias for Q403 is obtained by a voltage divider consisting of resistors R419 and R421. Transistor Q403 is stabilized by emitter resistor R422 which is bypassed by capacitor C416 to ground. The amplified output of Q403 is applied across the collector load resistor R426 and is coupled through capacitor C418 to the following stages.

LOCAL OSCILLATOR

The local oscillator, Q301, is a single-gate silicon field effect transistor (FET). The oscillator tuned circuit consists of coil L301, trimmer capacitor C301 and tuning capacitor C501C. Oscillator injection voltage is coupled through capacitor C308 to gate 2 of mixer Q201. This Hartley oscillator is designed to operate 455 kHz higher in frequency than the received radio signal on Bands A, B, C, and D, 455 kHz lower in frequency on Band E; and 4.034 MHz higher on Band F.

AVC AMPLIFIER

A portion of the amplified signal from transistor Q403 is coupled through capacitor C421 to the base of the AVC (automatic volume control) Amplifier C404. This signal is rectified by the base-emitter portion of Q404 and a positive voltage drop is developed across the load resistor R432. This voltage causes a collector current to flow and a resultant drop in collector voltage that corresponds to the changes in signal strength. This varying DC voltage is applied as bias to IF Amplifier Q402, thereby controlling its gain.

A portion of the amplified signal from IF Amplifier Q403 is also coupled through capacitor C419 to diodes D403 and D404. These two diodes form a voltage doubler circuit which provides AVC voltage for RF amplifier Q101. Resistors R423, R424, and R425 establish the correct forward bias point for gate 2 of field effect transistor Q101 under no signal conditions. When a signal is received, the bias changes from a positive voltage, through zero, to a negative voltage. This voltage varies, depending upon the signal strength. Resistor R505 and capacitor C511 form an AVC timing circuit.

DETECTORS

A portion of the output signal from IF amplifier Q403 is applied to AM detector D401 for AM operation. This output signal is also applied through capacitor C429 to gate 1 of product detector Q405 for CW (continuous wave), or SSB (single sideband) reception. Q405 is a dual-gate silicon field effect transistor (FET) which exhibits excellent isolation between gate 1 and gate 2, eliminating BFO oscillator "pulling" or overloading on very strong signals. Gate 2 of transistor Q405 is biased by a voltage divider consisting of resistors R433 and R434.

Injection voltage from BFO oscillator Q410 is applied to gate 2 of product detector Q405 when the front panel switch is in the CW/SSB position. The IF signal and the BFO signal are combined (mixed) in the transistor. The resultant output is an audio signal that is developed across resistor R441 and coupled through capacitor C433 to the AM-CW/SSB switch SW503B.

BFO

Transistor Q410 is a Colpitts oscillator which is extremely stable over wide ranges of temperature. Capacitors C425 and C426 provide the proper feedback for oscillation and form a tuned circuit with T401 to resonate at 455 kHz. Resistors R437 and R438 form a voltage divider and apply DC biasing to the base of Q410. Emitter resistor R436 provides temperature stabilization for the transistor. Injection voltage is coupled to gate 2 of product detector Q405, through capacitor C424. The BFO is actuated by the AM-CW/SSB switch in the CW/SSB position. This switch applies DC operating voltage to the circuit through RFC 403.

CONVERSION OSCILLATOR

Transistor Q411 and its associated circuitry form the 3.579 MHz heterodyne oscillator, which is used to provide double conversion on Band F only. Injection voltage is coupled through capacitor C407 to gate 2 of Q401 which is operated as a mixer on Band F only.

ANL

The detected audio is connected from the AM-CW/SSB switch to the AF Gain control R505 by one of two paths, depending upon the position of ANL (automatic noise limiter) switch SW506. When the ANL switch is in the OFF position, the audio signal is routed through capacitor C436 to capacitor C439 which is connected to the AF Gain control. When the ANL switch is in the ANL position, the audio signal is routed through the automatic noise limiter circuitry instead of capacitor C436.

The detected audio signal is prevented from flowing through resistors R445 and R446. These two resistors, along with capacitor C438, form an audio filter that stops the audio signal, but allows a small DC voltage to pass through. This small DC voltage biases the cathode of diode D402. The audio signal then passes through resistor R444, diode D402, and capacitor C439 to AF GAIN control R505. The diode clips the peaks of the audio signal, thus limiting noise spikes.

AUDIO AMPLIFIER

The aduio signal from AF Gain control R505 is coupled through capacitor C441 to the base of audio preamplifier transistor Q406. Resistors R449 and R451 form a voltage divider to provide the correct bias to Q406. DC operating bias is obtained from the RCV/STBY switch through resistor R449. The audio output from Q406 is developed across the load resistor R454 and direct coupled to the second audio driver transistor Q407.

The output of Q407 is also direct coupled to the audio output transistors Q408 and Q409, which operate as a complementary pair. Bias voltage for the output transistors is obtained from resistors R455 and R456. Audio output is coupled from the emitter resistors R457 and R458 through capacitor C446 to the 16 ohm speaker or headphone jack. A portion of the output is fed back to the emitter of preamplifier Q406 through resistor R453 and capacitor C444 to aid stabilization and minimize distortion.

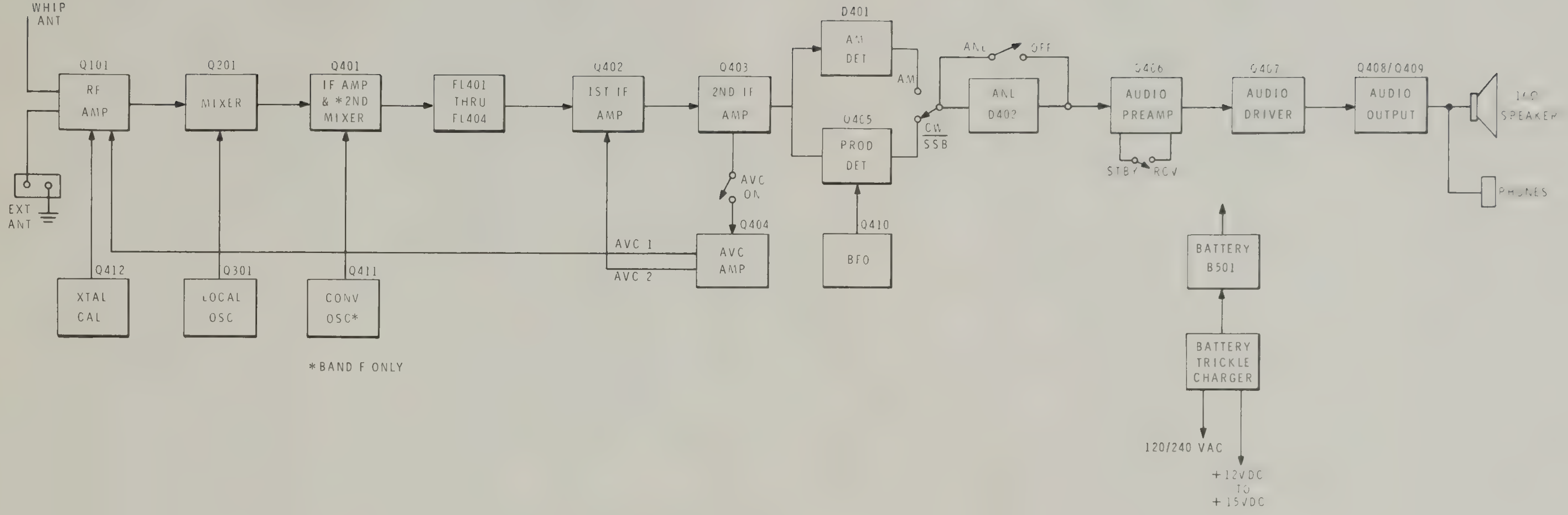
CRYSTAL CALIBRATOR

Transistor Q412, crystal Y1, and the associated circuitry form a 500 kHz calibration oscillator which is switched on by the front panel Cal switch, SW504. This 500 kHz oscillator provides accurate calibration markings every 500 kHz for dial calibration.

CHARGING CIRCUIT

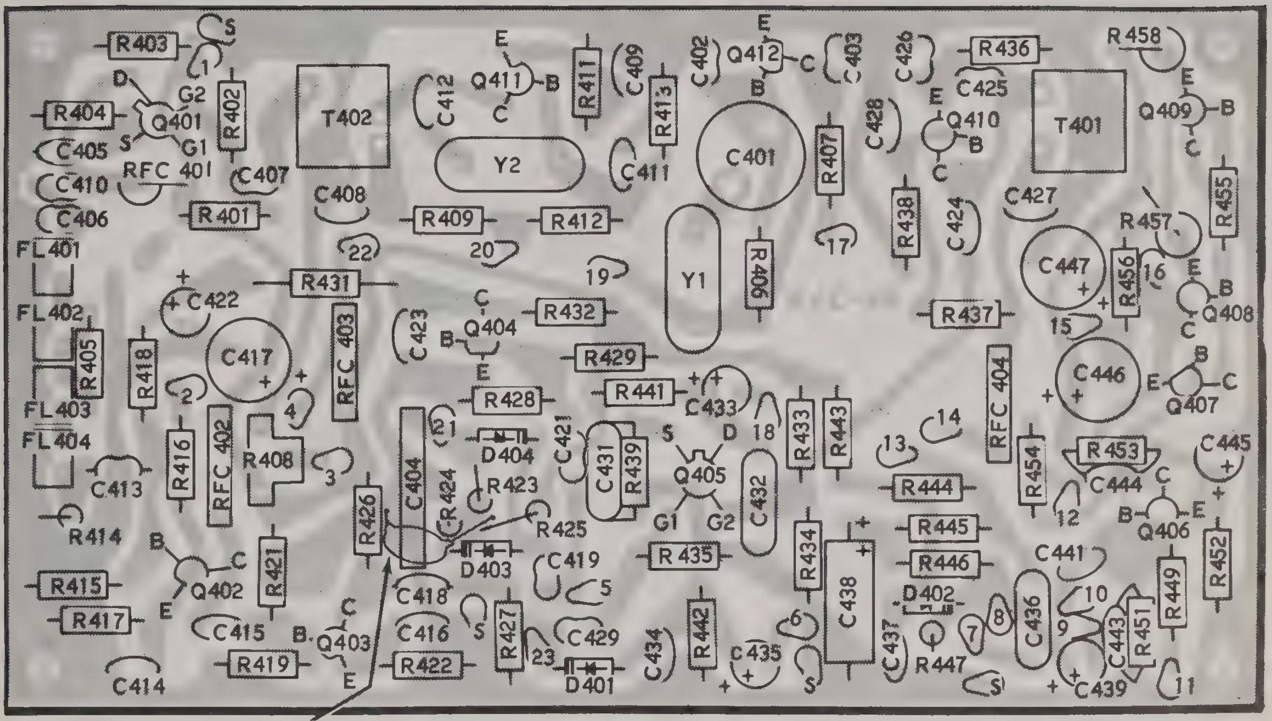
The battery is electrically divided in half for charging from AC. When the AC power cord is plugged into a power outlet, the AC voltage from the secondary of transformer T501 is applied through diode D501 on one-half cycle to charge one-half of the battery. On the other half cycle the voltage is applied through diode D502 to charge the other half of the battery.

The battery can also be charged from 12 to 15 VDC. When the DC power cord is connected to a power source, the DC voltage is applied through diode D503, pilot lamp PL-502, and resistor R503 to the battery. The diode protects the battery from being discharged in case the external DC charging voltage is connected backwards. The pilot lamp and resistor function primarily as a DC charging current limiter. The lamp may not necessarily be lit.


WHIP ANT
EXT ANT
Q101
RF AMP
Q201
MIXER
Q401
IF AMP & *2ND MIXER
FL401 THRU FL404
Q402
1ST IF AMP
Q403
2ND IF AMP
AVC ON
Q404
AVC AMP
AVC 1
AVC 2
Q412
XTAL CAL
Q301
LOCAL OSC
Q411
CONV OSC*
*BAND F ONLY
D401
AM DET
AM
Q405
PROD DET
CW/SSB
Q410
BFO
ANL
OFF
ANL D402
Q406
AUDIO PREAMP
STBY
RCV
Q407
AUDIO DRIVER
Q408/Q409
AUDIO OUTPUT
16Ω SPEAKER
PHONES
BATTERY B501
BATTERY TRICKLE CHARGER
120/240 VAC
+12VDC TO +15VDC

BLOCK DIAGRAM

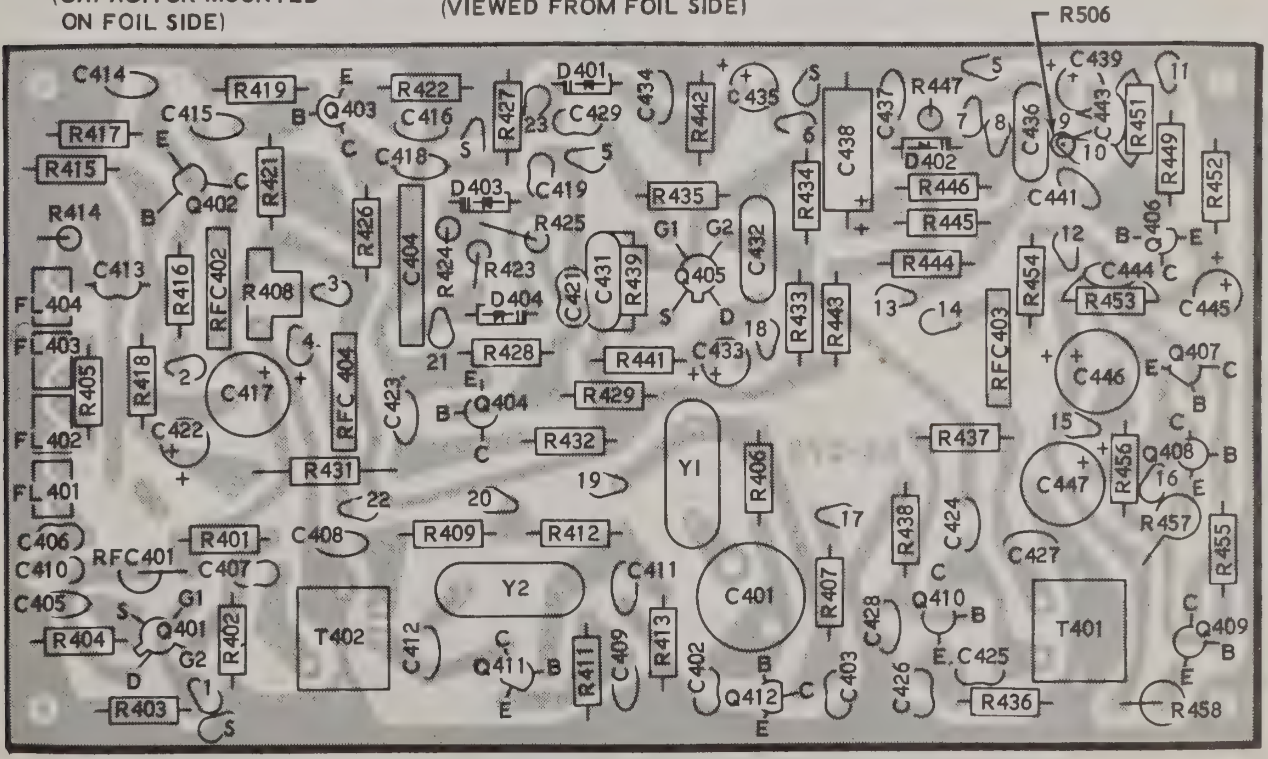
CIRCUIT BOARD X-RAY VIEWS


R403
S
1
D
G2
Q401
G1
S
R404
R402
C405
C410
RFC 401
C407
C406
R401
FL401
T402
C408
E
Q411
B
C
C412
Y2
R411
C409
R413
C411
R409
R412
22
20
19
C402
E
Q412
C
B
C403
C401
R407
C426
C428
E
Q410
B
C
C425
R436
T401
R458
E
Q409
B
C
R455
R438
C424
C427
R457
17
Y1
R406
C447
R456
16
E
B
Q408
C
15
FL402
+
C422
R431
C
Q404
B
E
R432
C423
R429
R405
R418
C417
+
+
RFC 403
R437
RFC 404
C446
+
E
B
C
Q407
FL403
FL404
2
4
RFC 402
R408
3
R428
R441
+
C433
18
C404
21
D404
C421
C431
R439
S
D
Q405
G1
G2
C432
R433
R443
14
13
R454
R453
C444
C445
+
C413
R416
R423
R424
R426
R425
R444
12
C
B
E
Q406
R414
B
C
Q402
E
R421
D403
C419
R435
R434
C438
+
+
R445
R446
C441
R452
R415
C418
5
D402
10
R417
C415
C
B
Q403
E
C416
S
R427
C429
R442
6
7
8
C436
9
R449
R451
C443
R419
R422
23
D401
C434
C435
+
S
C437
R447
S
+
C439
11
C414

C420
(CAPACITOR MOUNTED
ON FOIL SIDE)

RECEIVER CIRCUIT BOARD

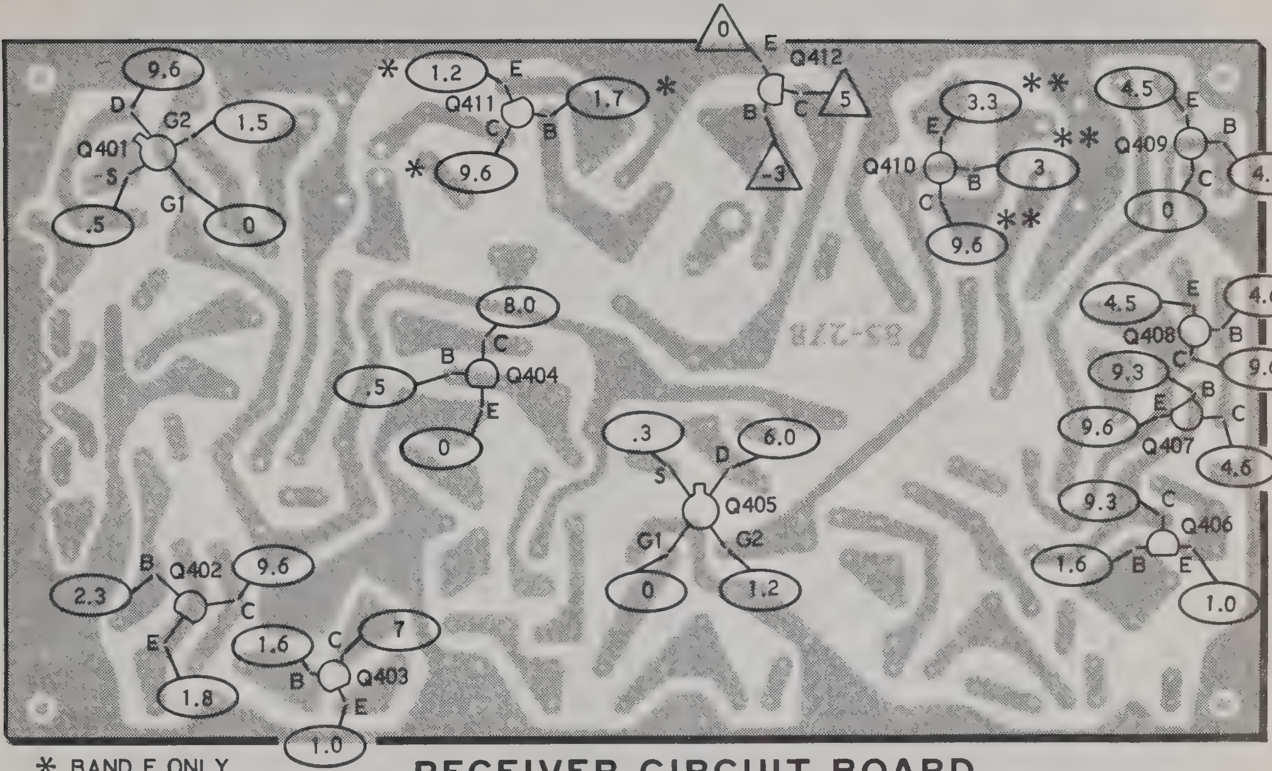
(VIEWED FROM FOIL SIDE)


R506
C414
R419
E
B
Q403
C
R422
R427
D401
C429
23
C434
+
R442
C435
S
C438
C437
R447
7
8
C436
9
10
+
C439
C443
R451
11
R449
R452
C415
R417
E
R415
C
B
Q402
C416
C418
S
5
R421
6
D402
R434
R446
R445
+
C441
R414
R426
C404
D403
C419
R435
R425
G1
G2
R444
12
B
Q406
E
C
C444
R453
+
C445
C413
FL404
R416
RFC402
R408
3
R424
R423
D404
C421
C431
R439
Q405
S
D
C432
R433
R443
13
14
RFC403
R454
FL403
4
2
C417
+
+
RFC 404
21
R428
R441
C433
18
+
C446
E
Q407
C
B
R405
R418
C422
+
E
Q404
B
C
R429
R432
C423
R437
15
C
Q408
B
16
E
C447
+
R456
FL402
R431
22
20
19
Y1
R406
17
R438
C424
R457
FL401
C406
C410
RFC401
C405
R401
C407
C408
R409
R412
C411
C401
R407
C427
R455
S
G1
Q401
R404
G2
D
R402
T402
C412
Y2
C
Q411
B
E
R411
C409
R413
C402
B
Q412
C
E
C403
C428
C
Q410
B
E
C425
C426
R436
T401
C
Q409
B
E
R458
R403
1
S

RECEIVER CIRCUIT BOARD

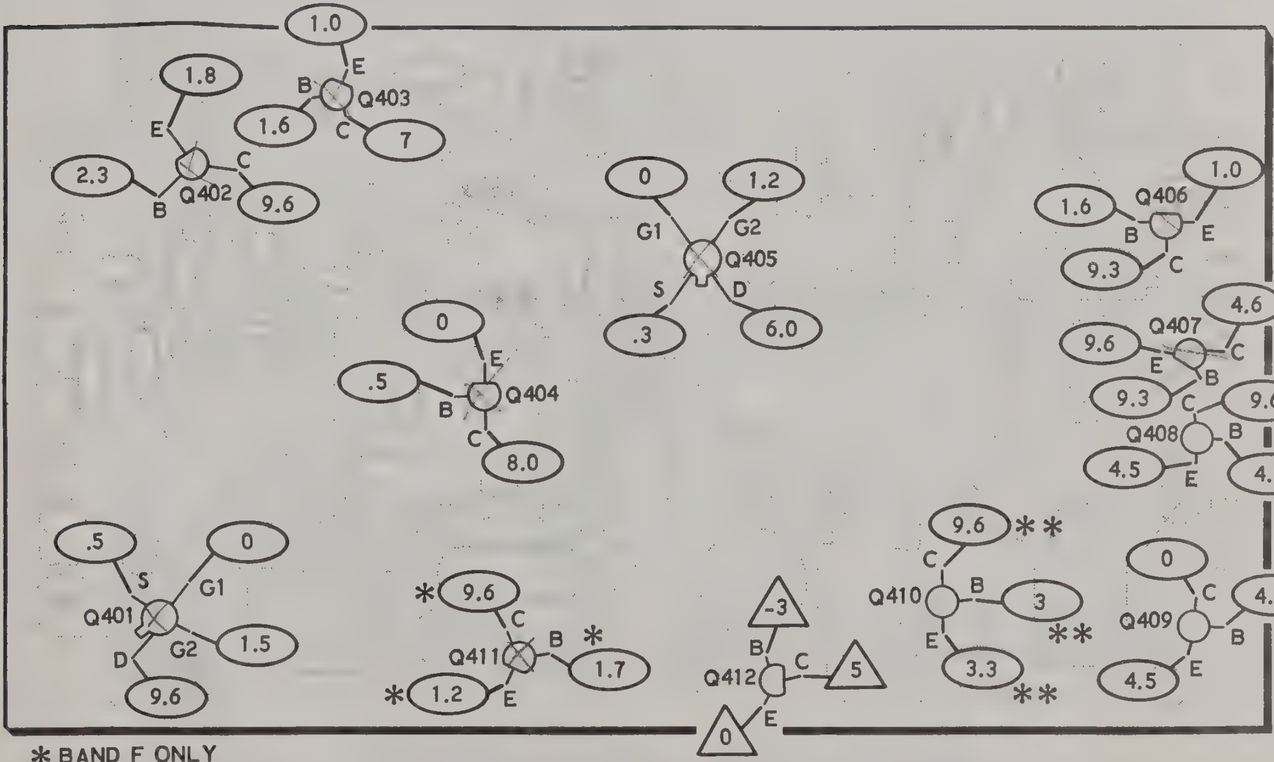
(VIEWED FROM COMPONENT SIDE)

VOLTAGE CHARTS


Q401
D 9.6
G2 1.5
S .5
G1 0
Q411
E 1.2 *
B 1.7 *
C 9.6 *
Q412
E 0
C 5
B -3
Q410
E 3.3 **
B 3 **
C 9.6 **
Q409
E 4.5
B 4.4
C 0
Q404
C 8.0
B .5
E 0
Q405
S .3
D 6.0
G1 0
G2 1.2
Q408
E 4.5
B 4.6
C 9.6
Q407
E 9.6
B 9.3
C 4.6
Q406
C 9.3
B 1.6
E 1.0
Q402
B 2.3
C 9.6
E 1.8
Q403
B 1.6
C 7
E 1.0
85-278

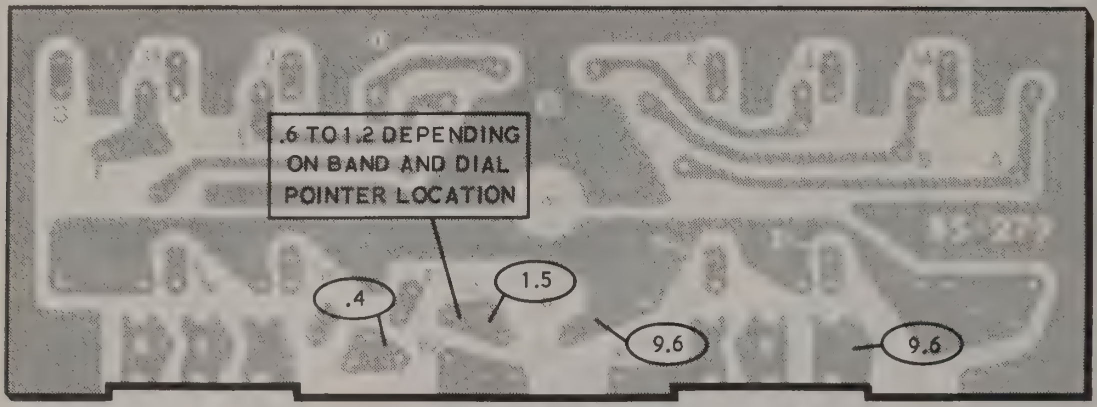
* BAND F ONLY
Δ CALIBRATE ONLY
** SWITCH IN CW/SSB MODE

RECEIVER CIRCUIT BOARD
(VIEWED FROM FOIL SIDE)


Q403
E 1.0
B 1.6
C 7
Q402
E 1.8
B 2.3
C 9.6
Q405
G1 0
G2 1.2
S .3
D 6.0
Q406
E 1.0
B 1.6
C 9.3
Q407
C 4.6
E 9.6
B 9.3
Q408
C 9.6
B 4.6
E 4.5
Q404
E 0
B .5
C 8.0
Q401
S .5
G1 0
G2 1.5
D 9.6
Q411
C 9.6 *
B 1.7 *
E 1.2 *
Q412
B -3
C 5
E 0
Q410
C 9.6 **
B 3 **
E 3.3 **
Q409
C 0
B 4.4
E 4.5

* BAND F ONLY
△ CALIBRATE ONLY
** SWITCH IN CW/SSB

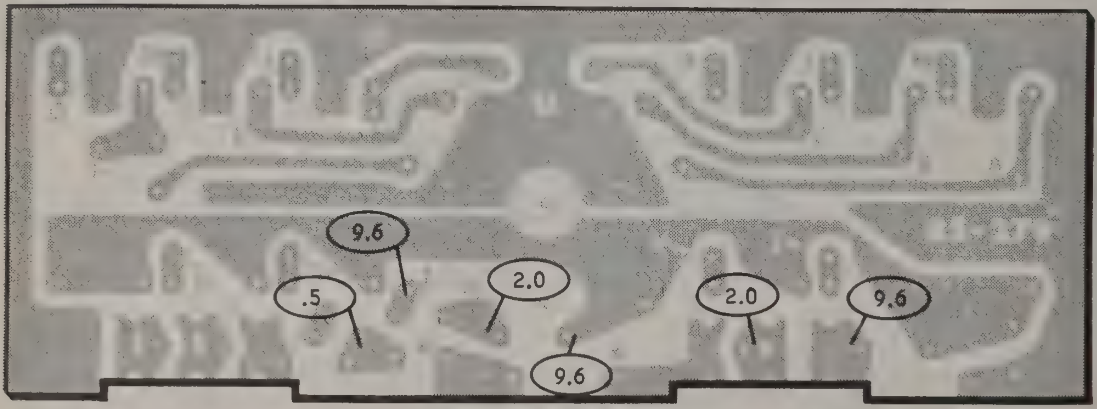
RECEIVER CIRCUIT BOARD
(VIEWED FROM COMPONENT SIDE)


.6 TO 1.2 DEPENDING ON BAND AND DIAL POINTER LOCATION
.4
1.5
9.6
9.6
85-279

DC
RF VOLTAGE

MIXER SWITCH-BOARD

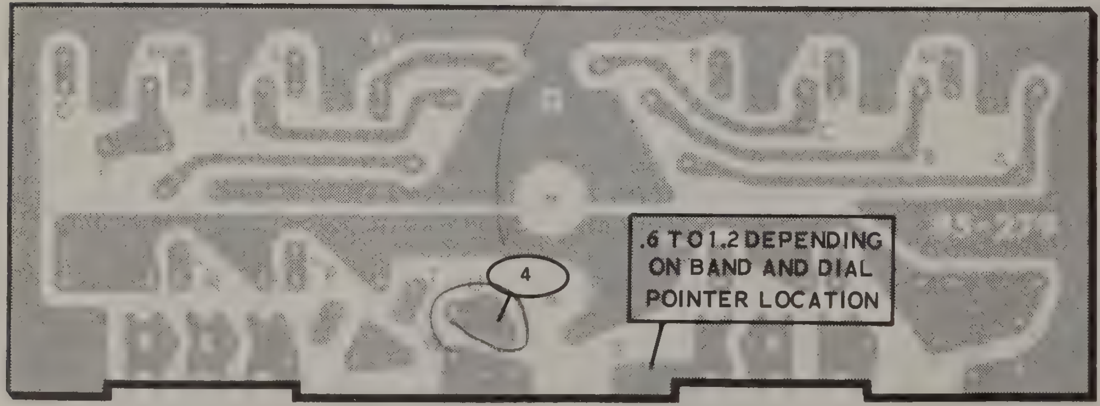
(VIEWED FROM FOIL SIDE)


9.6
.5
2.0
9.6
2.0
9.6
85-279

RF GAIN CONTROL
FULLY CLOCKWISE

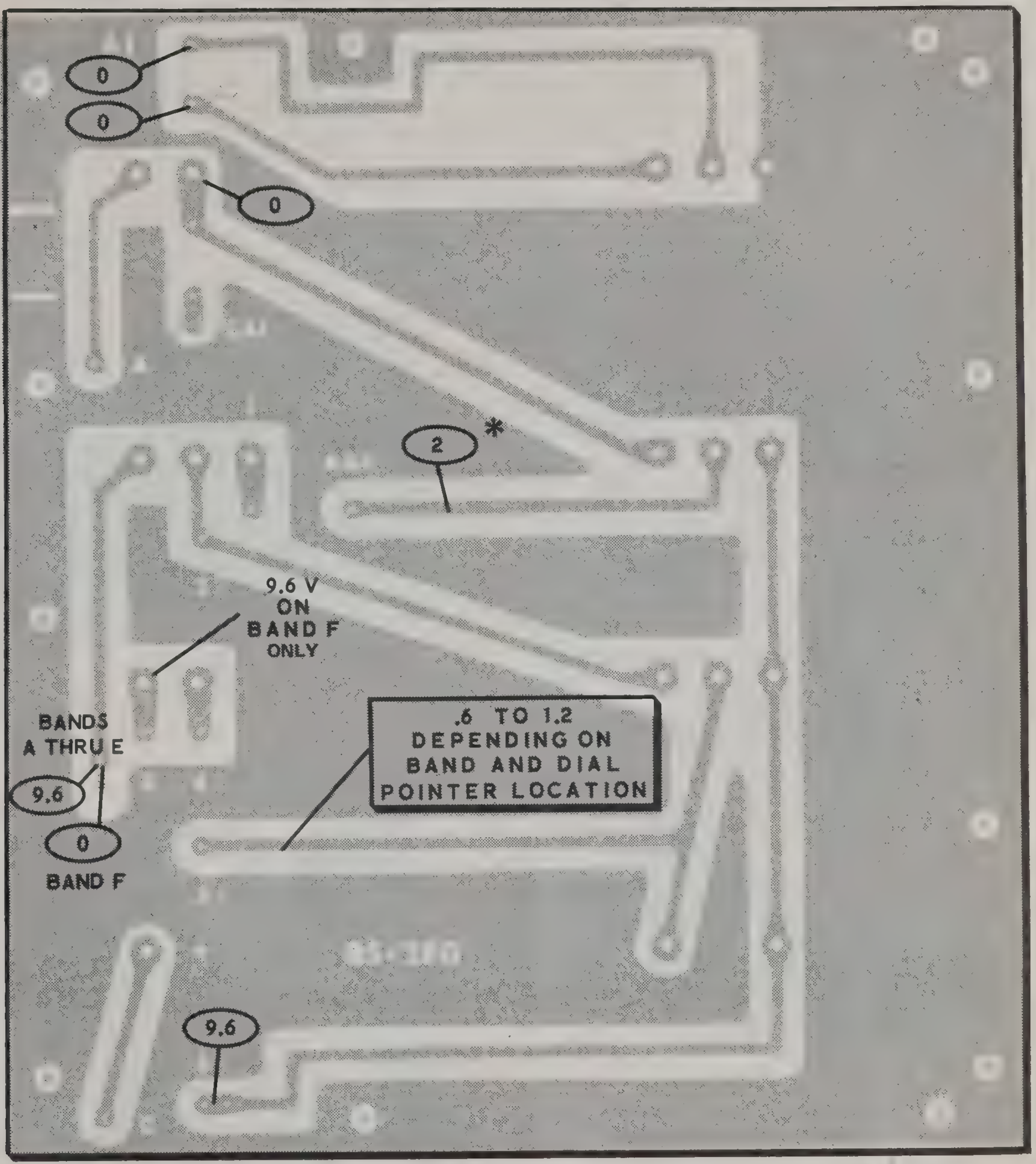
RF SWITCH-BOARD

(VIEWED FROM FOIL SIDE)


4
.6 TO 1.2 DEPENDING ON BAND AND DIAL POINTER LOCATION
85-279

OSCILLATOR SWITCH-BOARD

(VIEWED FROM FOIL SIDE)


A1
0
0
0
2 *
9.6 V
ON
BAND F
ONLY
.6 TO 1.2
DEPENDING ON
BAND AND DIAL
POINTER LOCATION
BANDS
A THRU E
9.6
0
BAND F
9.6

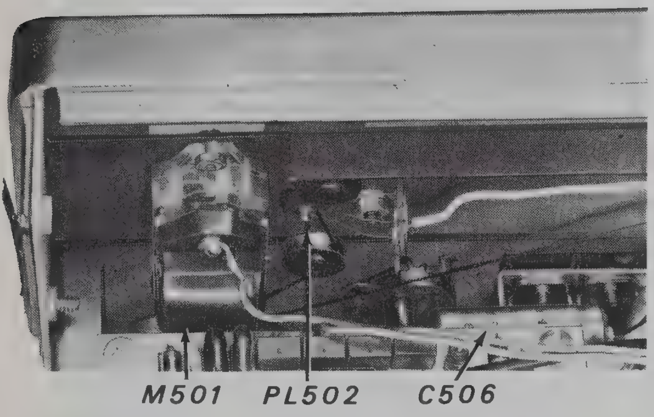
LARGE CIRCUIT BOARD

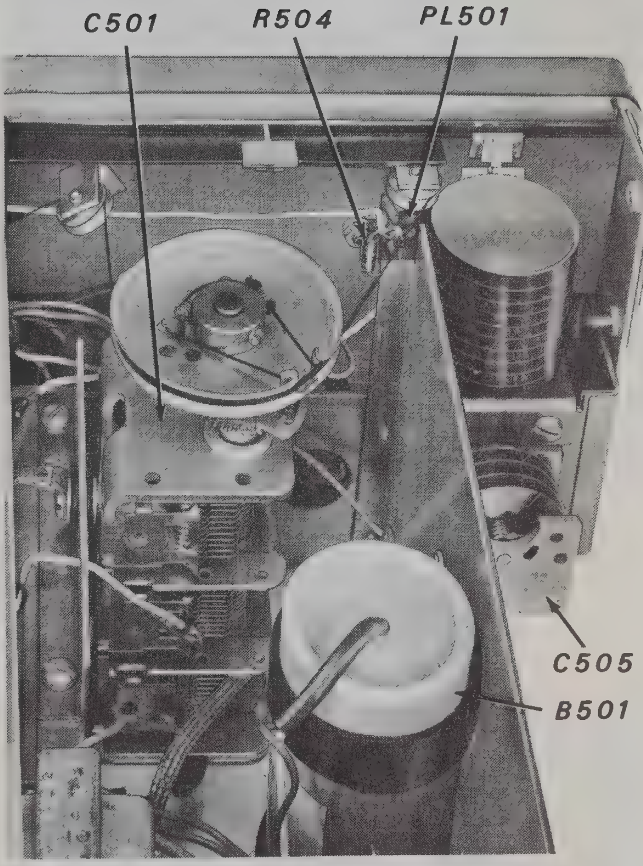
(VIEWED FROM FOIL SIDE)

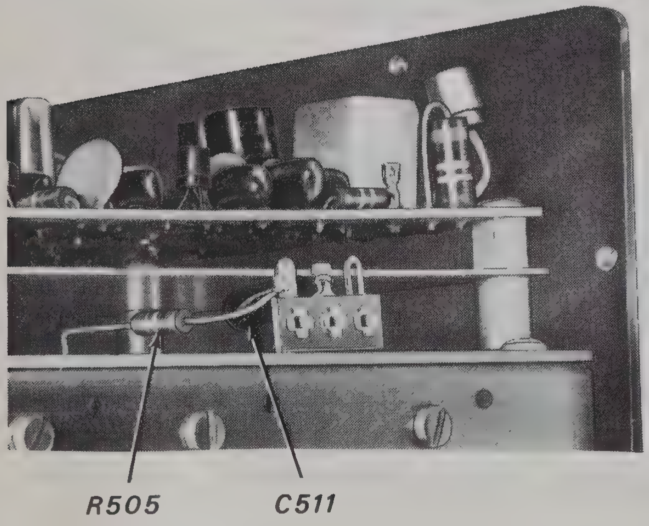
*VARIES WITH SIGNAL STRENGTH

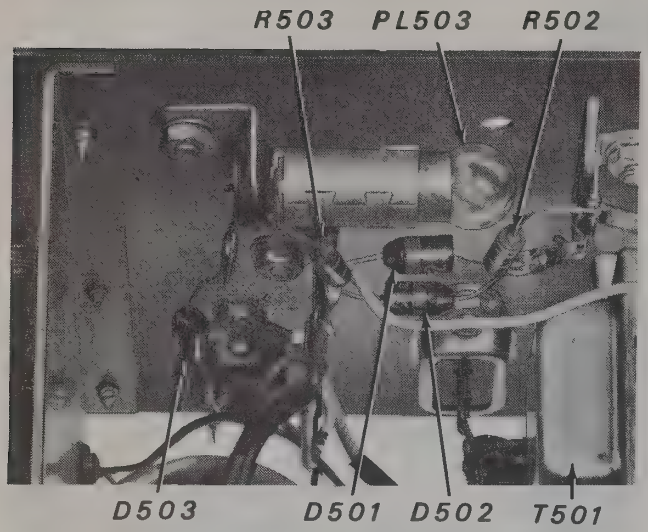
616 [illegible] 22 [illegible]
GR [illegible]
[illegible]

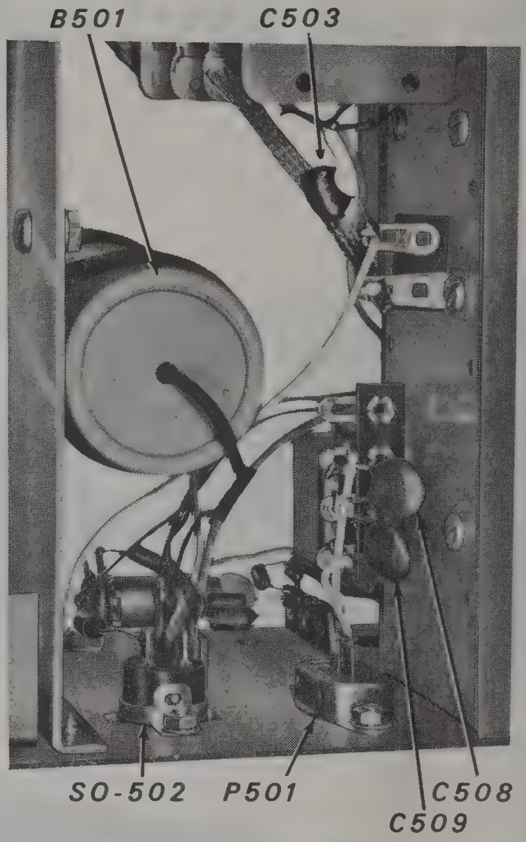
CHASSIS PHOTOGRAPHS

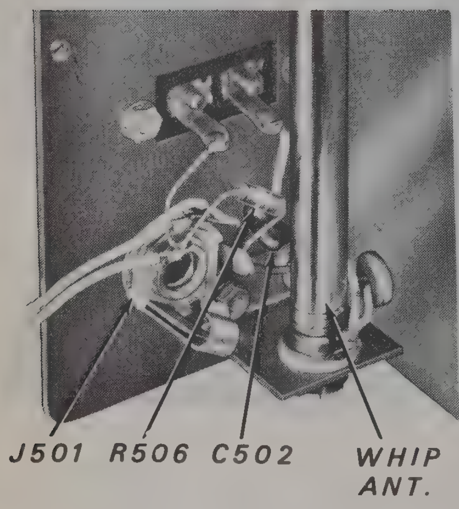

M501
PL502
C506

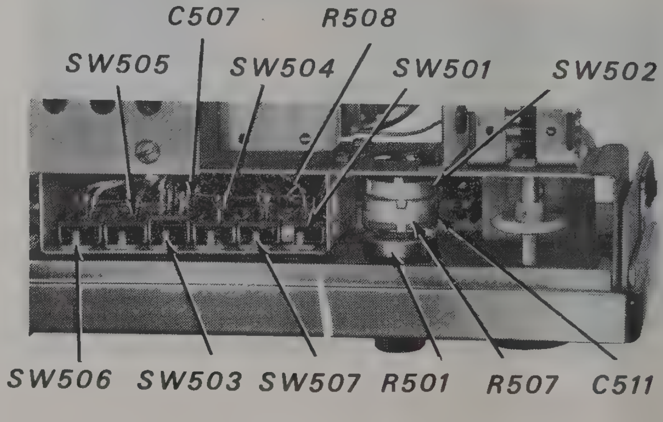

C501
R504
PL501
C505
B501



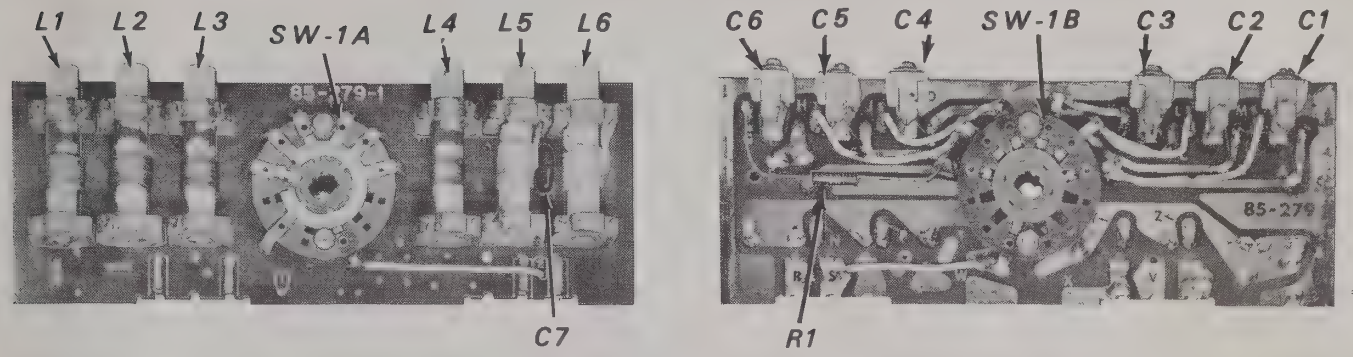

R503
PL503
R502
D503
D501
D502
T501


B501
C503
SO-502
P501
C508
C509

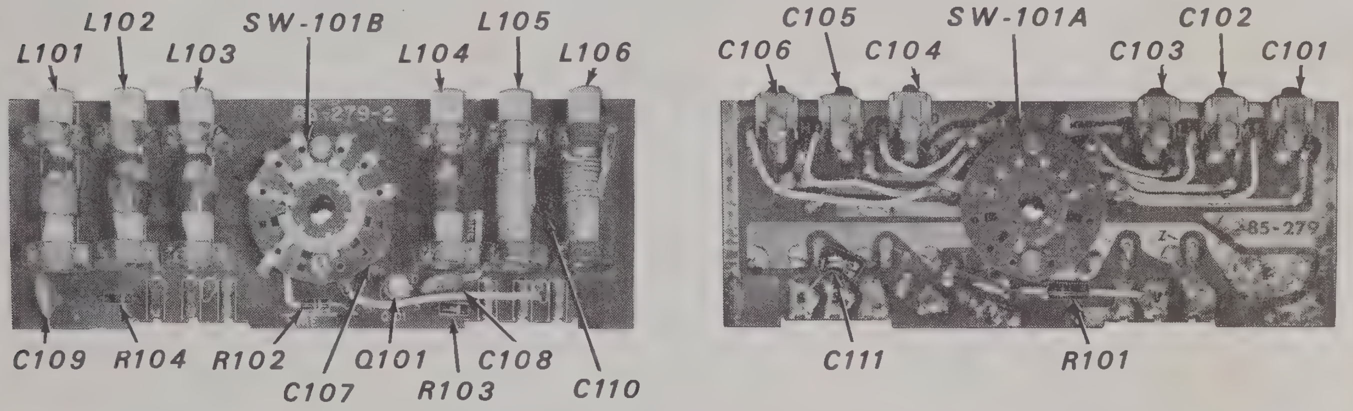

J501
R506
C502
WHIP ANT.


C507
R508
SW505
SW504
SW501
SW502
SW506
SW503
SW507
R501
R507
C511

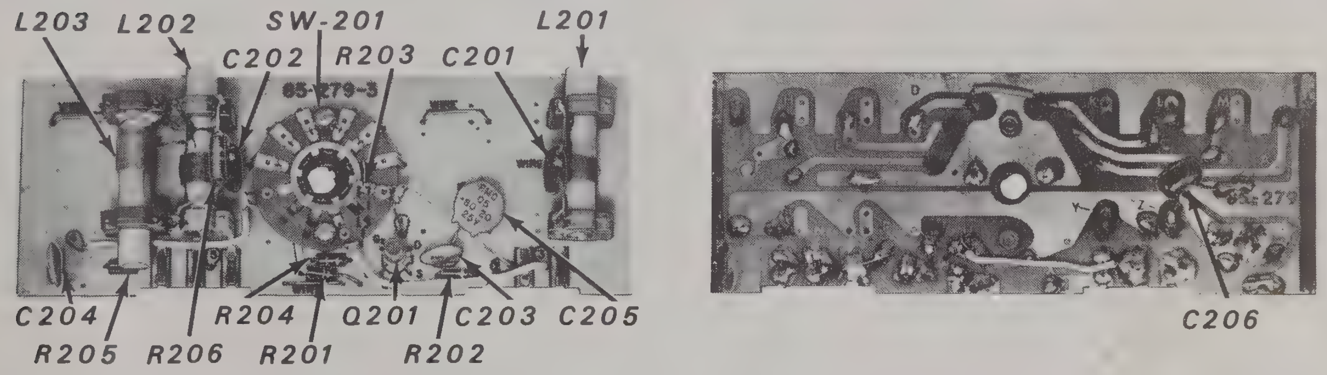
ANTENNA SWITCH-BOARD (#85-279-1)


L1
L2
L3
SW-1A
L4
L5
L6
85-279-1
C7
C6
C5
C4
SW-1B
C3
C2
C1
85-279
R1

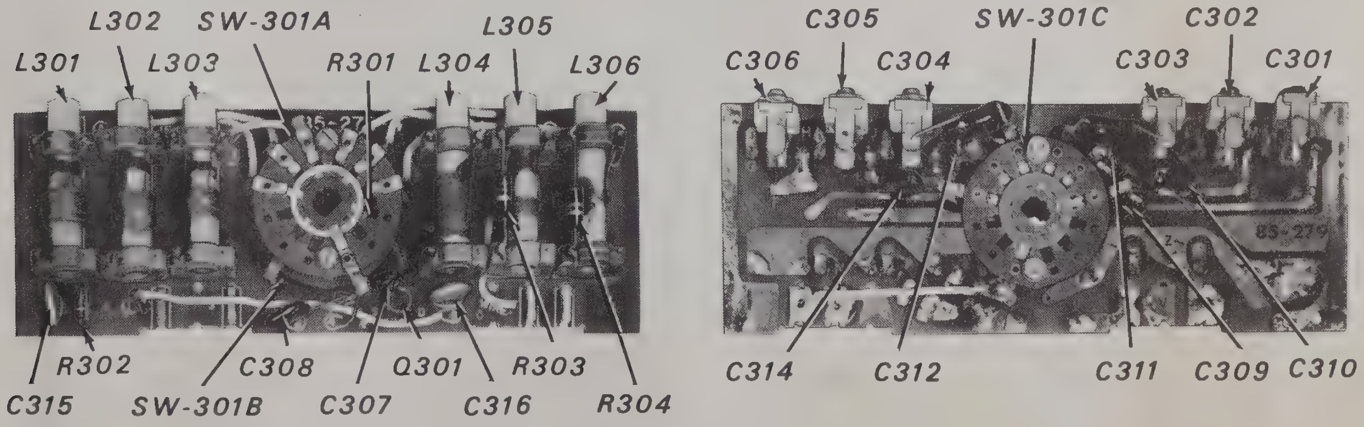
RF SWITCH-BOARD (#85-279-2)

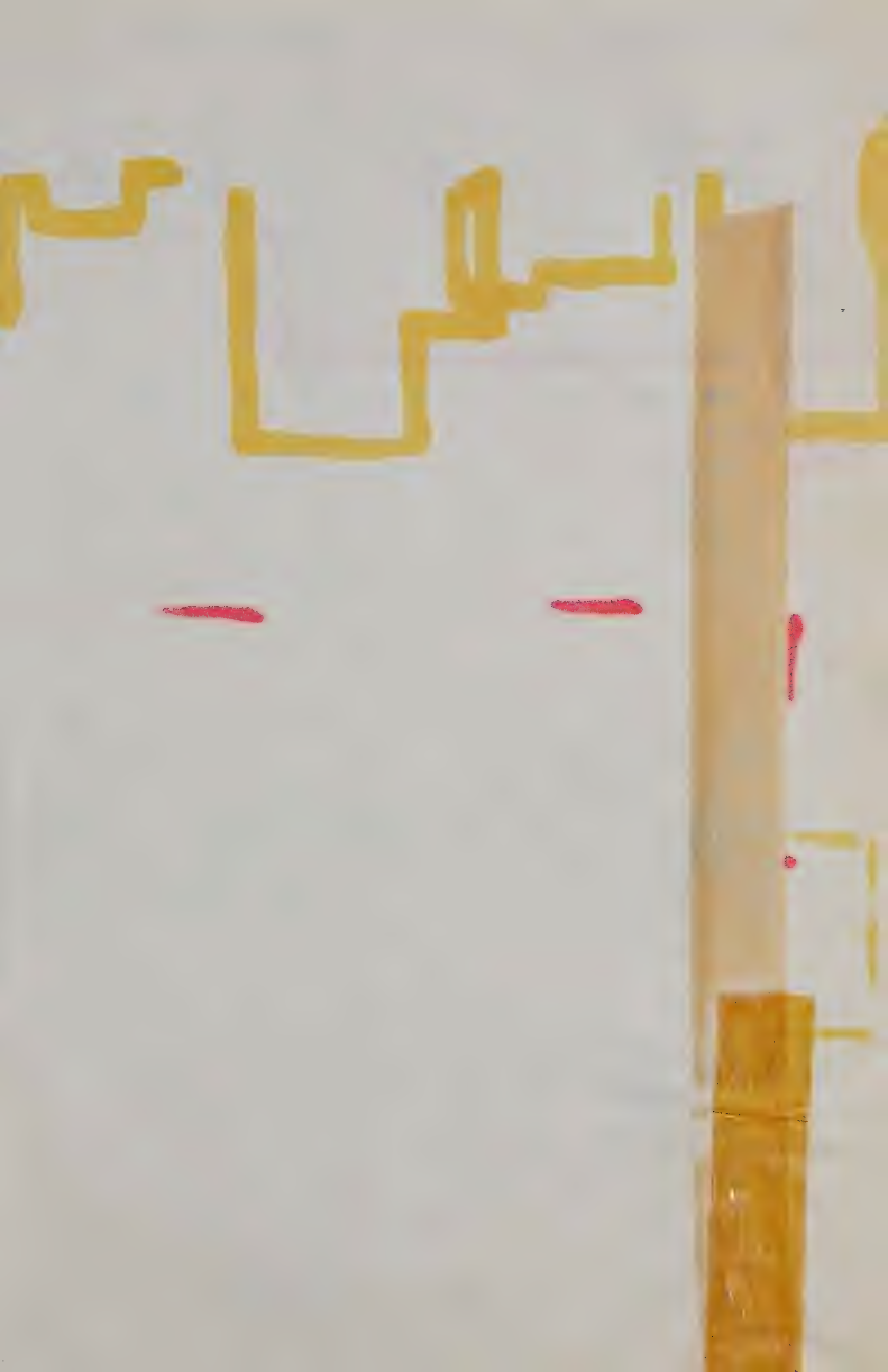

L101
L102
L103
SW-101B
L104
L105
L106
85-279-2
C109
R104
R102
C107
Q101
R103
C108
C110
C106
C105
C104
SW-101A
C103
C102
C101
85-279
C111
R101

MIXER SWITCH-BOARD (#85-279-12)


L203
L202
SW-201
C202
R203
C201
L201
85-279-3
C204
R205
R206
R204
R201
Q201
R202
C203
C205
85-279
C206

OSCILLATOR SWITCH-BOARD (#85-279-13)


L301
L302
L303
SW-301A
R301
L304
L305
L306
C315
R302
SW-301B
C308
C307
Q301
C316
R303
R304
C306
C305
C304
SW-301C
C303
C302
C301
85-279
C314
C312
C311
C309
C310



SCHEMATIC OF THE HEATHKIT® GENERAL COVERAGE RECEIVER MODEL GR-78

NOTES:

1. COMPONENT PART NUMBERS ARE IN THE FOLLOWING GROUPS:

1-99	ANTENNA SWITCH-BOARD.
100-199	RF SWITCH-BOARD.
200-299	MIXER SWITCH-BOARD.
300-399	OSCILLATOR SWITCH-BOARD.
400-499	RECEIVER CIRCUIT BOARD.
500-599	CHASSIS.

2 ALL RESISTORS ARE 1/2 WATT UNLESS MARKED OTHERWISE.

3 CAPACITOR VALUES LESS THAN 1 ARE IN μF. VALUES OF 1 AND ABOVE ARE IN PF UNLESS MARKED OTHERWISE.

4 BANDSWITCH WAFERS ARE IN BAND A POSITION AS VIEWED FROM THE KNOB END OF THE SWITCH SHAFT.

5. VOLTAGE MEASUREMENTS ARE MADE WITH THE SWITCHES AND CONTROLS IN THE FOLLOWING POSITIONS:

RF GAIN	-	FULLY CLOCKWISE.
METER ADJUST	-	1/4 TURN CLOCKWISE.
AM-CW/SSB	-	CW/SSB POSITION.
ANL-OFF	-	ANL POSITION.
BAND	-	BAND A POSITION.
TUNING	-	ANY DIAL LOCATION.

6. ⬭ THIS SYMBOL INDICATES A POSITIVE DC VOLTAGE MEASUREMENT TAKEN WITH AN 11 MEGOHM INPUT VOLTMETER FROM THE POINT INDICATED TO CHASSIS GROUND. VOLTAGES MAY VARY ±20%.

7. △ THIS SYMBOL INDICATES AN RF VOLTAGE.

8. ▽ THIS SYMBOL INDICATES A CIRCUIT BOARD GROUND.

9. ⏚ THIS SYMBOL INDICATES A CHASSIS GROUND.

10. □ THIS SYMBOL INDICATES CONNECTING POINTS TO THE CIRCUIT BOARD.

11 ■ THIS SYMBOL INDICATES A SWITCH-BOARD CONNECTOR PIN.

12. → THIS SYMBOL INDICATES A CLOCKWISE ROTATION OF CONTROLS AS VIEWED FROM THE KNOB END OF THE SHAFT.

13. ⟆ THIS SYMBOL INDICATES A ROCKER SWITCH.

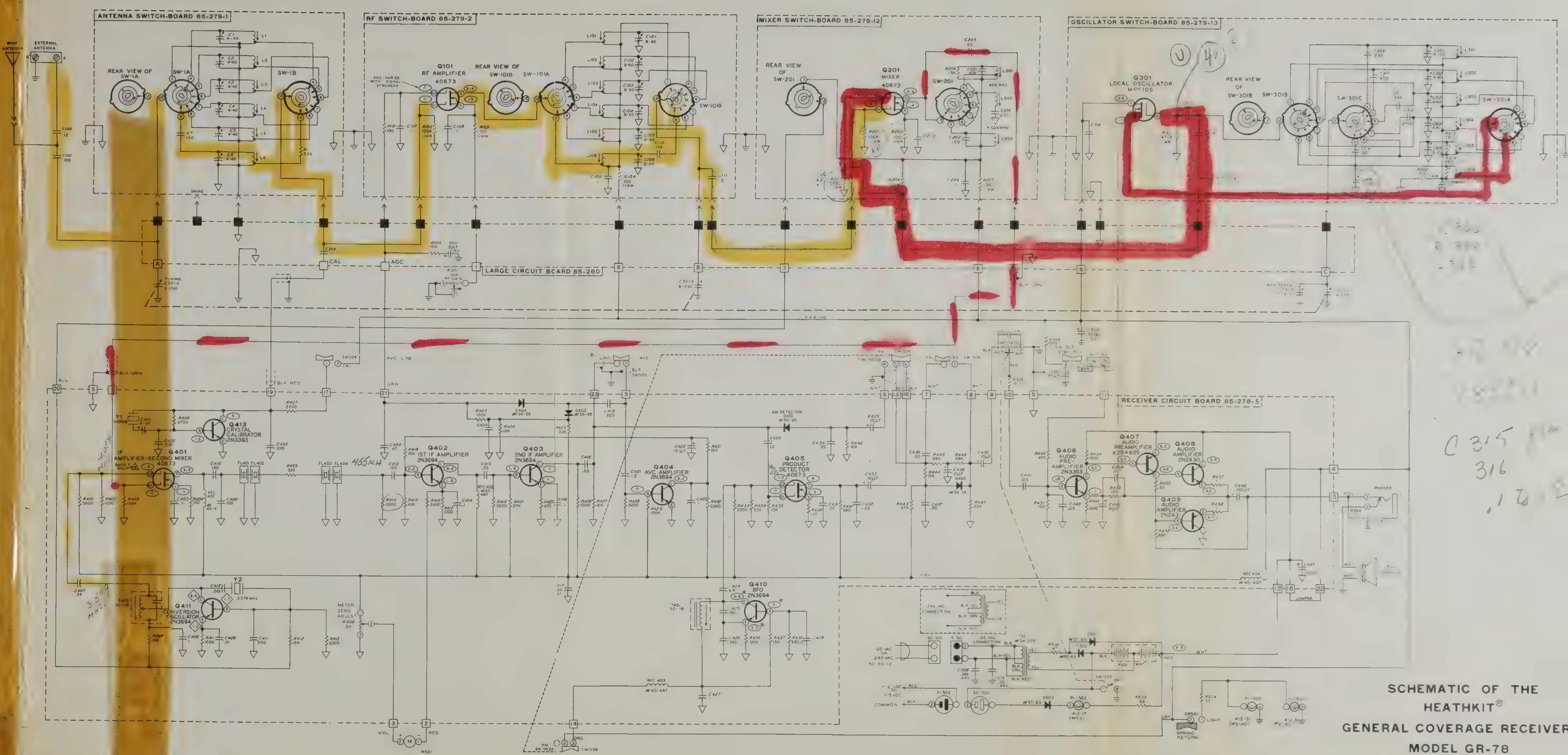
14. ⏚ THIS SYMBOL INDICATES THE GROUND CONNECTIONS MADE BY THE SWITCH-BOARD GUIDES.

15. THE DOTS ON SOME SWITCH ROTORS INDICATES A CONNECTION FROM THE CONTACT ON THE FRONT OF THE ROTOR TO A CONTACT ON THE REAR OF THE ROTOR.

16. ▭ THIS SYMBOL INDICATES A DC VOLTAGE THAT VARIES DEPENDING ON BAND AND DIAL POINTER LOCATION.

17. ◇ THIS SYMBOL INDICATES A VOLTAGE IN BAND F ONLY.

18. * SWITCH IN CW/SSB POSITION.


ANTENNA SWITCH-BOARD 85-279-1
WHIP ANTENNA
EXTERNAL ANTENNA
REAR VIEW OF SW-1A
SW-1A
SW-1B
RF SWITCH-BOARD 85-279-2
AGC-VARIES WITH SIGNAL STRENGTH
Q101 RF AMPLIFIER 40673
REAR VIEW OF SW-101B
SW-101A
SW-101B
MIXER SWITCH-BOARD 85-279-12
REAR VIEW OF SW-201
Q201 MIXER 40673
SW-201
455 KHZ
4.034 MHZ
OSCILLATOR SWITCH-BOARD 85-279-13
Q301 LOCAL OSCILLATOR MPF105
REAR VIEW OF SW-301B
SW-301B
SW-301C
SW-301A
U
4
SPARE
CAL
AGC
LARGE CIRCUIT BOARD 85-280
TUNING C501A 9-290
R301 50K RF GAIN
+9.6 VDC
BLK-GRN
BLK RED
AVC LINE
GRN
SW504
SW505
Y1 500KHz
Q412 CRYSTAL CALIBRATOR 2N3393
Q401 IF AMPLIFIER-SECOND MIXER 40673
BAND F ONLY
455KH.
Q402 1ST IF AMPLIFIER 2N3694
Q403 2ND IF AMPLIFIER 2N3694
Q404 AVC AMPLIFIER 2N3694
AM DETECTOR D401 #56-26
Q405 PRODUCT DETECTOR 40673
Y2 3.579 MHz
Q411 CONVERSION OSCILLATOR 2N3694
3.579 MHz
METER ZERO ADJUST R408
Q410 BFO 2N3694
RFC 403
RECEIVER CIRCUIT BOARD 85-278-5
Q406 AUDIO PRE-AMPLIFIER 2N3393
Q407 AUDIO PREAMPLIFIER X29A829
Q408 AUDIO AMPLIFIER 2N2430
Q409 AUDIO AMPLIFIER 2N2431
PHONES
JUMPER
240 VAC CONNECTION
120 VAC OR 240 VAC 50 60 HZ
120 VAC CONNECTION
+12 VDC TO +15 VDC
COMMON
SW-502
SW501
LIGHT
SPRING RETURN
C 315
316
.1

SCHEMATIC OF THE
HEATHKIT®
GENERAL COVERAGE RECEIVER
MODEL GR-78

EXPEDITED PARTS ORDER FORM

(FOR REPAIR PARTS ONLY)

PLEASE DO NOT WRITE IN THIS SPACE

TO: **HEATH COMPANY**
BENTON HARBOR,
MICHIGAN 49022
TTN PARTS REPLACEMENT

E	TOTAL PRICE	DESIRED METHOD OF SHIPMENT
		EDITORS INITIALS

C.O.D. AUTHORIZATION

SIGNED

UR DISTRIBUTOR.

EASE DO NOT WRITE IN THIS SPACE

TO: **HEATH COMPANY**
BENTON HARBOR,
MICHIGAN 49022
ATTN PARTS REPLACEMENT

CE	TOTAL PRICE	DESIRED METHOD OF SHIPMENT
		EDITORS INITIALS

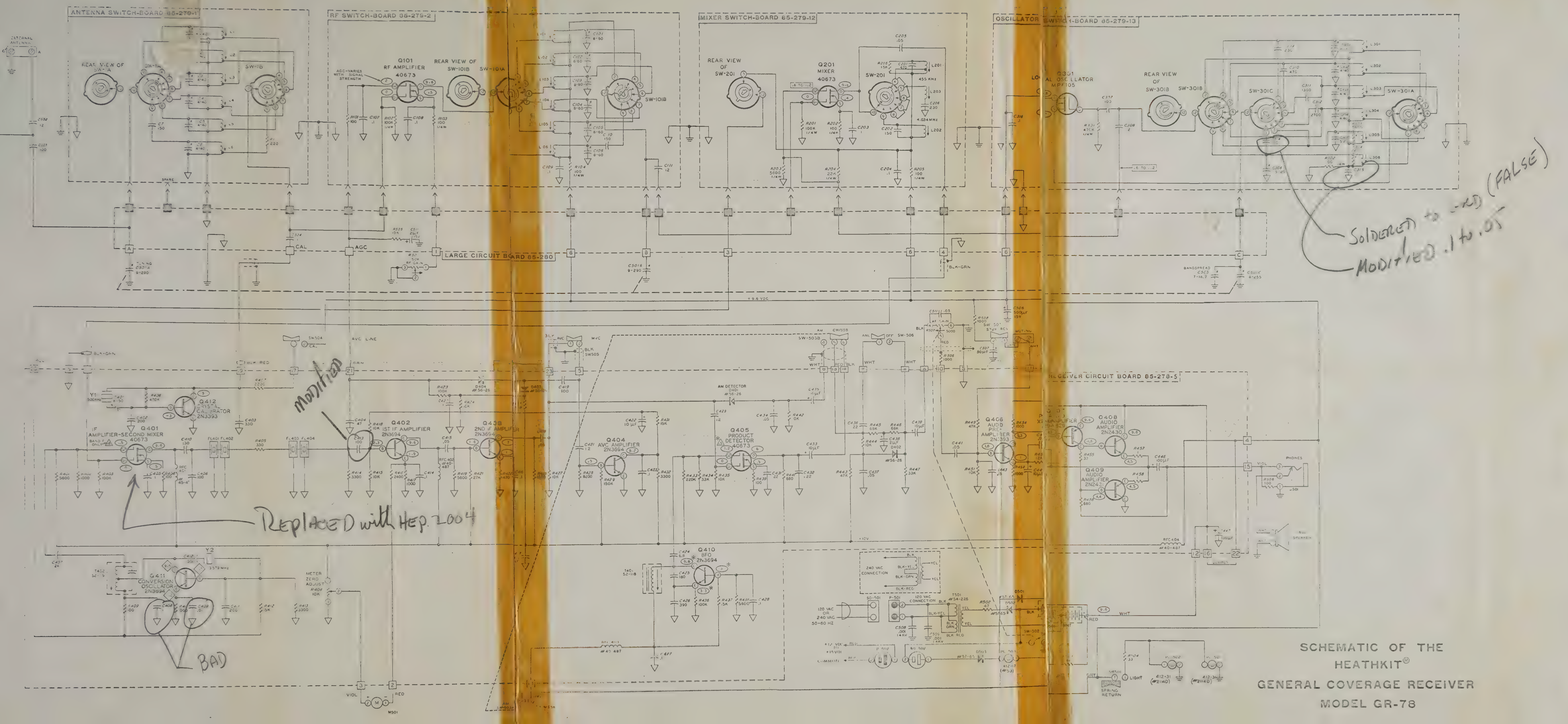
C.O.D. AUTHORIZATION

C.O.D. IS $10.00).

- MICHIGAN RESIDENTS ADD 4% SALES TAX

SIGNED

THIS FORM IS FOR U.S. CUSTOMERS ONLY. OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR.


ANTENNA SWITCH-BOARD 85-279-1
RF SWITCH-BOARD 85-279-2
MIXER SWITCH-BOARD 85-279-12
OSCILLATOR SWITCH-BOARD 85-279-13
LARGE CIRCUIT BOARD 85-280
RECEIVER CIRCUIT BOARD 85-278-5
EXTERNAL ANTENNA
REAR VIEW OF SW-1A
REAR VIEW OF SW-101B
REAR VIEW OF SW-201
REAR VIEW OF SW-301B
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AGC-VARIES WITH SIGNAL STRENGTH
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Q406 AUDIO PRE-AMPLIFIER 2N3393
Q407 AMPLIFIER
Q408 AUDIO AMPLIFIER 2N2430
Q409 AUDIO AMPLIFIER 2N2431
PHONES
SPEAKER
Q411 CONVERSION OSCILLATOR 2N3694
METER ZERO ADJUST
Q410 BFO 2N3694
240 VAC CONNECTION
120 VAC CONNECTION
120 VAC OR 240 VAC 50-60 HZ
SPRING RETURN
LIGHT
M501
Modified
REPLACED with HEP 2004
BAD
Soldered to grd (FALSE)
Modified .1 to .05

SCHEMATIC OF THE HEATHKIT®
GENERAL COVERAGE RECEIVER
MODEL GR-78

EXPEDITED PARTS ORDER FORM

(FOR REPAIR PARTS ONLY)

PLEASE DO NOT WRITE IN THIS SPACE

NAME ____________________

ADDRESS ____________________

CITY ____________ STATE ____________ ZIP ________

SEND TO: **HEATH COMPANY**
BENTON HARBOR,
MICHIGAN 49022
ATTN PARTS REPLACEMENT

KIT MODEL	PURCHASE DATE	INVOICE NUMBER	LOCATION PURCHASED

QTY.	HEATH PART NUMBER	DESCRIPTION OF PART	PRICE	TOTAL PRICE

DESIRED METHOD OF SHIPMENT

EDITORS INITIALS

INSTRUCTIONS:

- INCLUDE CHECK OR MONEY ORDER FOR TOTAL PARTS ORDERED ADD 10% (MINIMUM $0.25) FOR INSURANCE, POSTAGE AND HANDLING.
- AUTHORIZE PERMISSION FOR C.O.D. SHIPMENT (MINIMUM ORDER SHIPPED C.O.D. IS $10.00).
- MICHIGAN RESIDENTS ADD 4% SALES TAX

C.O.D. AUTHORIZATION

____
SIGNED

THIS FORM IS FOR U.S. CUSTOMERS ONLY. OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR.

CUT ALONG DOTTED LINE

EXPEDITED PARTS ORDER FORM

(FOR REPAIR PARTS ONLY)

PLEASE DO NOT WRITE IN THIS SPACE

NAME ____________________

ADDRESS ____________________

CITY ____________ STATE ____________ ZIP ________

SEND TO: HEATH COMPANY
BENTON HARBOR,
MICHIGAN 49022
ATTN PARTS REPLACEMENT

KIT MODEL	PURCHASE DATE	INVOICE NUMBER	LOCATION PURCHASED

QTY.	HEATH PART NUMBER	DESCRIPTION OF PART	PRICE	TOTAL PRICE

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C.O.D. AUTHORIZATION

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SIGNED

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CUSTOMER SERVICE

REPLACEMENT PARTS

If you need a replacement part, please fill in the Parts Order Form that is furnished and mail it to the Heath Company. Or, if you write a letter, include the:

- **Part number** and **description** as shown in the **Parts List.**
- Model number and Series number from the blue and white label.
- Date of purchase.
- Nature of the defect.

Please do not return parts to the factory unless they are requested. Parts that are damaged through carelessness or misuse by the kit builder will not be replaced without cost, and will not be considered in warranty.

Parts are also available at the Heathkit Electronic Centers listed in your catalog. Be sure to provide the Heath part number. Bring in the original part when you request a warranty replacement from a Heathkit Electronic Center.

NOTE: Replacement parts are maintained specifically to repair Heathkit products. Parts sales for other reasons will be declined.

TECHNICAL CONSULTATION

Need help with your kit? . . . . Self-Service? . . . . Construction? . . . . Operation? . . . . Call or write for assistance. You'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek. . .please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit C.O.D. for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

HEATH
Schlumberger

HEATH COMPANY • BENTON HARBOR, MICHIGAN

THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

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HASTINGS, MN

MINIMUM RECYCLED CONTENT
10% POST-CONSUMER